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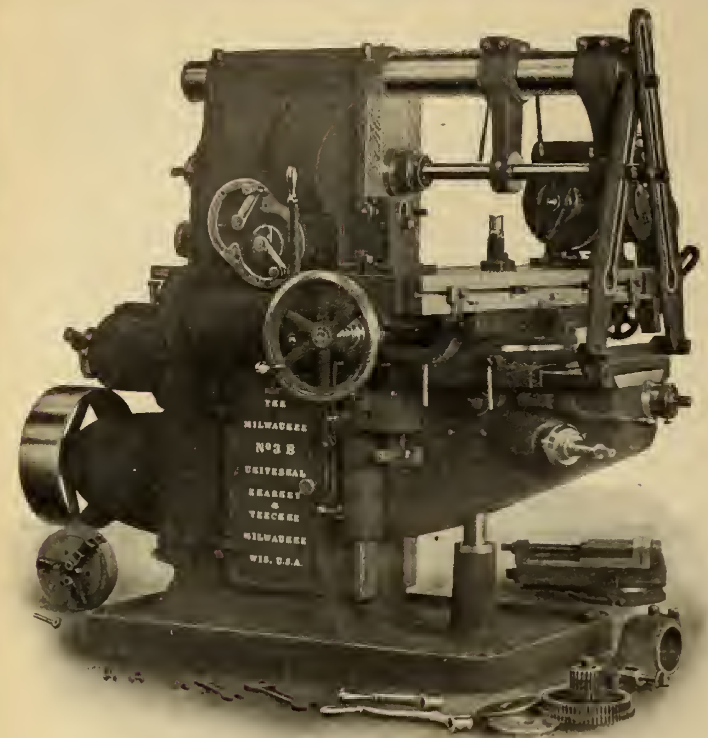
A monthly newspaper devoted to the manufacturing interests, covering in a practical manner the mechanical, power, foundry and allied fields. Published by The MacLean Publishing Company, Limited, Toronto, Montreal, Winnipeg, and London, Eng.

OFFICE OF PUBLICATION : 10 FRONT STREET EAST, TORONTO

Vol. IV. JANUARY, 1908 No. 1



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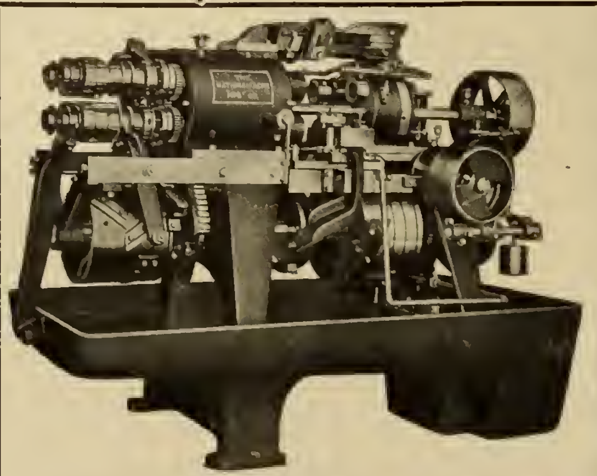

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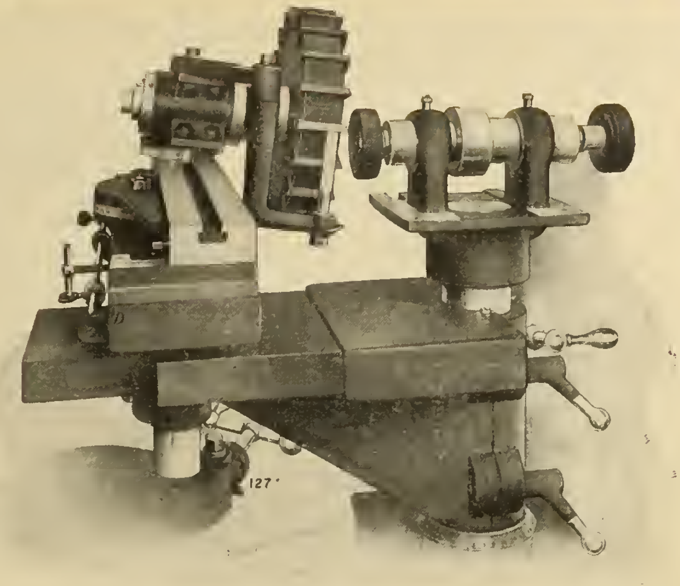

Sharpening a Side Mill.

cannot do satisfactory work unless it has sharp cutters. Cutters to be "sharp" must have all their teeth the same height, have the same angle of clearance, and have firm, sharp-cutting edges. A boy can get these results from the **Cincinnati Universal Cutter and Tool Grinder.** This illustration shows how it handles the cutters in the gang shown in the cut below. Our Treatise on Tool Room Grinding and Grinding Machines gives much information on this subject. Ask for it.

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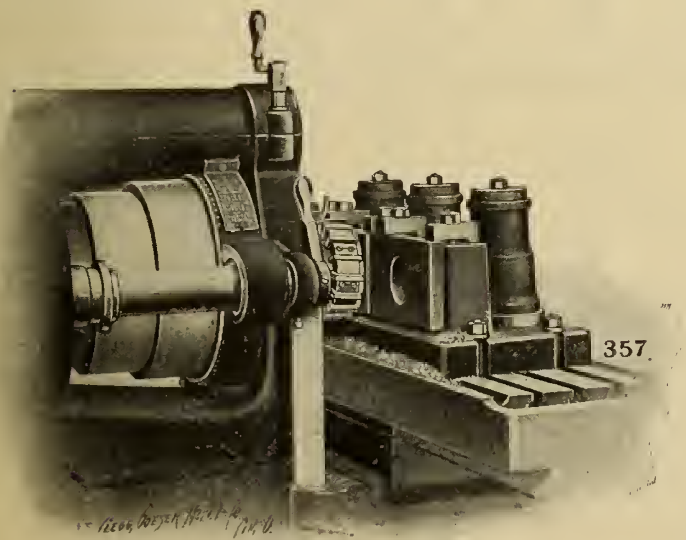

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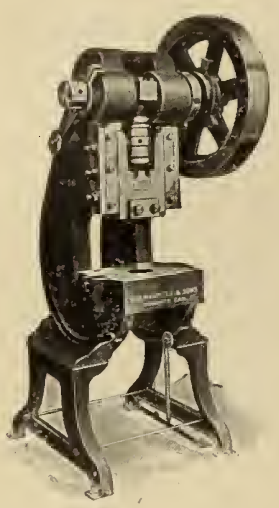

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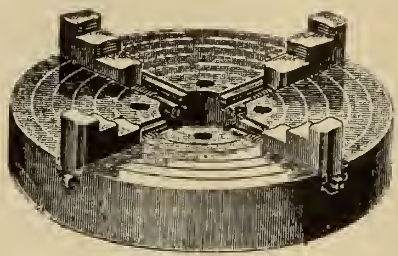

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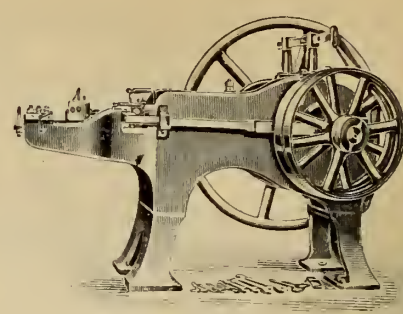

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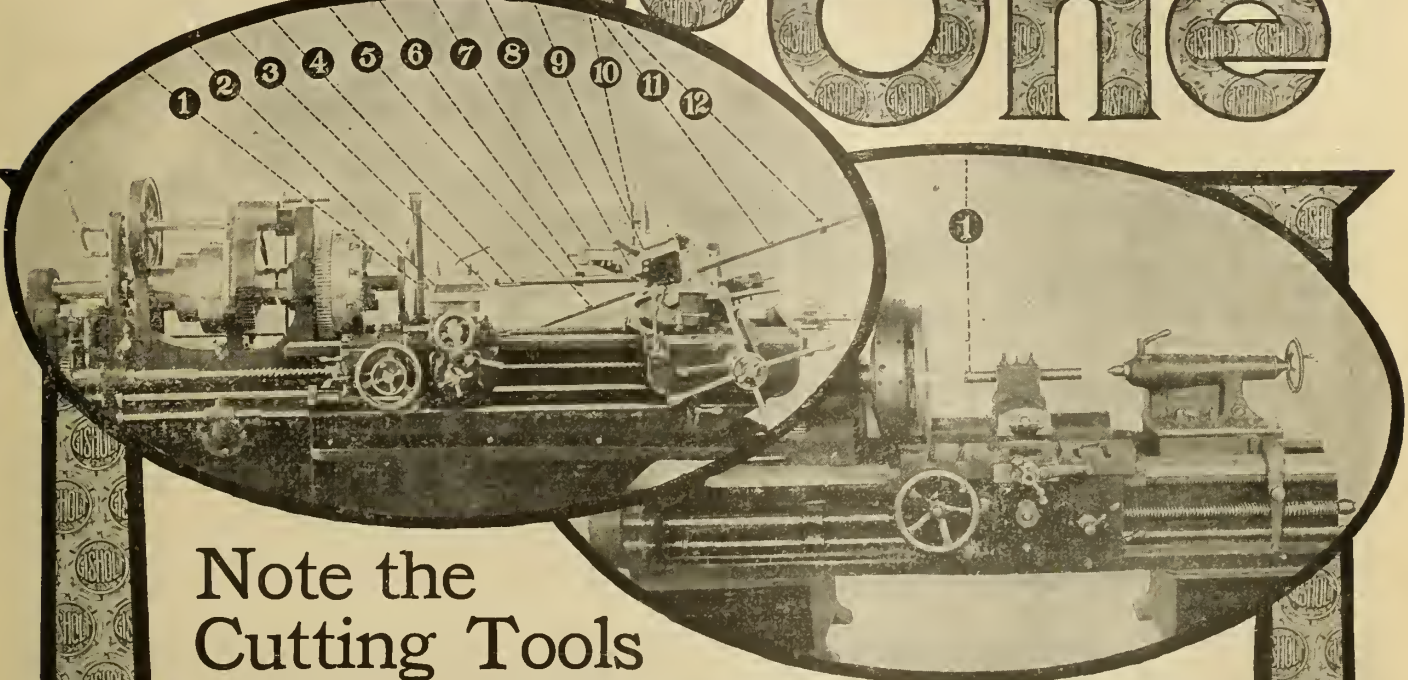

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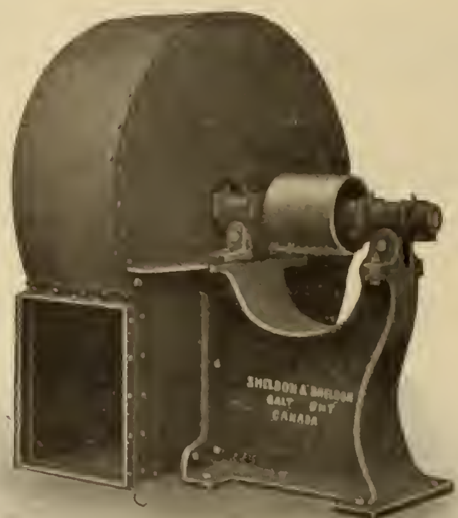

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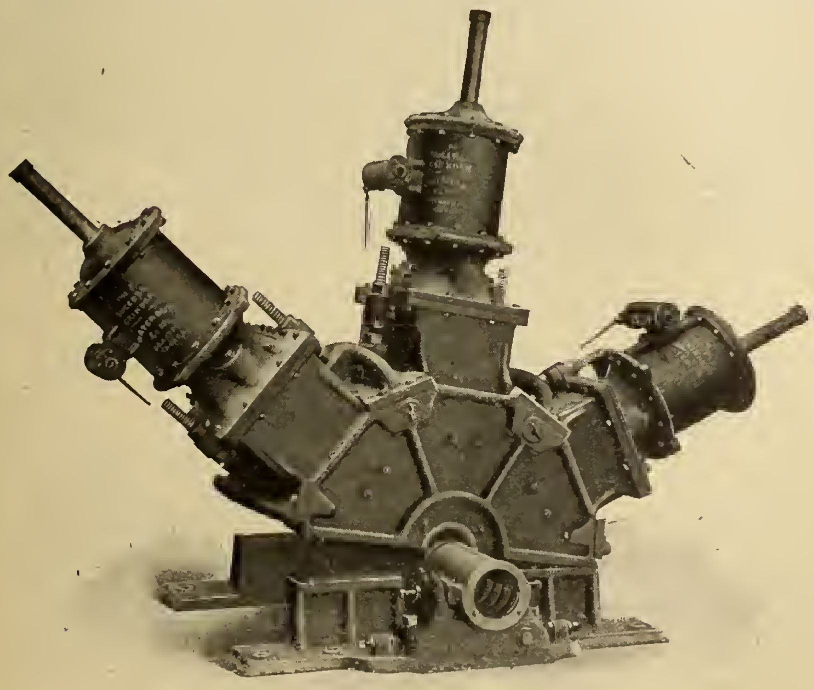

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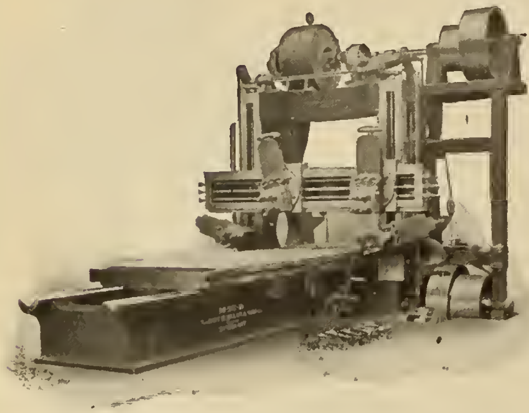

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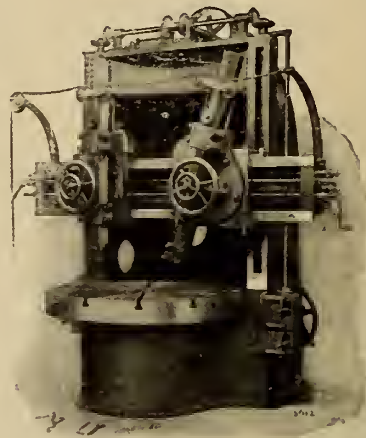

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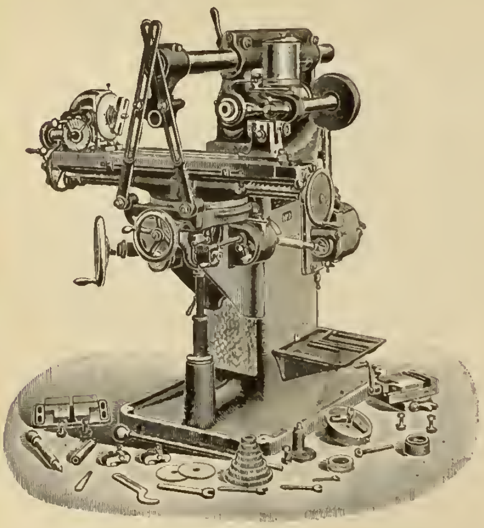

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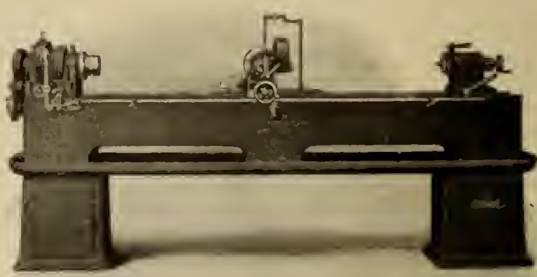

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An Immense Motor Driven Pneumatically Operated Planer

A Fourteen Foot Planer Built by Niles-Bement-Pond—Slotting and Transverse Planing Can be Done Without Readjustment

Probably the largest and heaviest metal working planer ever built has recently been shipped from the Bement-Niles Works. (Philadelphia) of the Niles-Bement-Pond Co. The total weight of the machine is 845,000 lbs. or 422½ tons. Four motors with a total capacity of 207½ h.p. are required to operate this remarkable tool.

The machine is, in general effect, an extremely large planer, but in addition to the movements found on a standard machine, many new ones have been added.

Heads Arranged for Slotter Bar and Transverse Planing.

Each head is fitted with a slotter bar independently driven by rack, giving a cutting speed that is practically constant from one end of the stroke to the other, and a quick return. Though motor and change gears, the cutting and return speeds can be changed as desired.

Each head is arranged for transverse planing, having a planing movement across the bed which can be varied within desired limits, and having a quick return.

The movements for slotting and transverse planing make it necessary to throw out the regular driving mechanism to the table and connect it to a separate feed motion which, in this case, is entirely distinct from the regular feed motion. This throwing out of the driving mechanism, however, means simply that the pneumatic driving clutches are thrown into and left in their idle position.

Points About Planer.

The machine is fitted with its own air compressor and motor, thus making it independent of the air supply in the shop, to which, however, it can be connected if it seems desirable.

A complete switchboard is furnished for control of all the motors.

The distance between uprights is 14 ft. 4 in.; the maximum distance from table to bottom of cross slide is 12 ft. 2in.; maximum stroke of table is 30 ft.; maximum stroke of slotter bar is 8 ft.; total width of bed, 13 ft.; length of bed, 60 ft.; table ways, 15 in. each in width; tool slides, 7 ft. 8 in. with 4 ft. vertical traverse; cross rail is long enough to admit full traverse of either head between the posts; face of uprights, 2 ft. 6 in.; vertical height of cross slide, including the top rib bracing is 5 ft.

The main driving motor is 100 h.p.; slotting and cross planing motor is 50 h.p.; lifting motor to cross slide, 20 h.p.; traverse motor for heads on cross slide, 7½ h.p.; air compressor motor, 30 h.p.

The cutting and return speeds are variable through the motor, which has a 1 to ½ variation and further range by change gears. The cutting speeds are 14 ft. to 25 ft. and return speeds 52½ to 65½ ft. The same style of drive is used for the slotter and gives a cutting speed of 18½ ft. to 30 ft. and return speed of 57 ft. to 71 ft. Cutting speed for cross planing is 11½ to 19 ft. and return speed 35 ft. to 43½ ft. The cross traverse speed to the heads is 50 in. per minute; the vertical speed for raising and lowering cross slide is 26 in. per minute.

Features of Main Drive.

The main drive from the 100 h.p. motor is clearly shown in Fig. 4, being through the gearing shown, to the pneumatic reversing clutches at the base of the upright. The speed of these clutches can be varied to some extent, as stated above, by changing the speed of the motor and a great variation obtained by the simple reversal of two change gears. The pneumatic clutches which are shown thoroughly incased are of well-known N-B-P type with a large number of friction discs, whereby great friction area is obtained in a comparatively small compass. These clutches, as their name implies, are operated by compressed air. A small valve, easily moved by hand, controls the stopping, starting and reversal of table and handles satisfactorily the power given out by the large driving motor. In the handling of this amount of power in a motor-driven planer, it is unnecessary to state that it would be quite impracticable if a belt drive was employed. From this point on to the rack the drive is, in practically every respect, that which is found on any planer, except of course, in this instance, it is exceptionally heavy and powerful.

It might be noted, however, that the drive is all of steel and the two bull

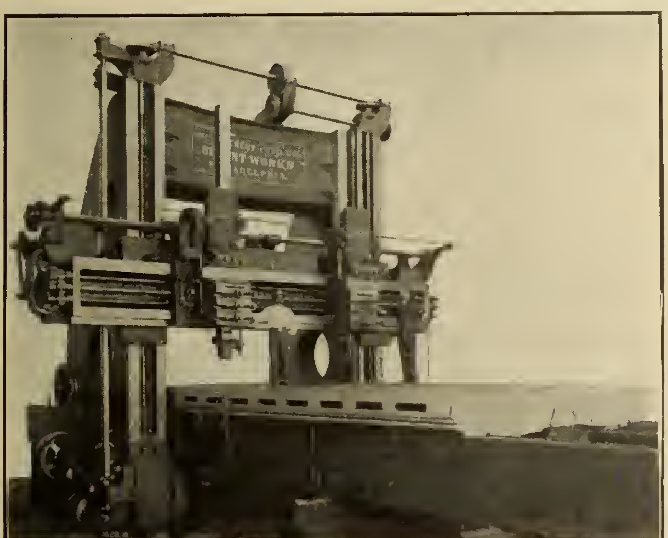


Fig. 1—Planer Completely Erected.

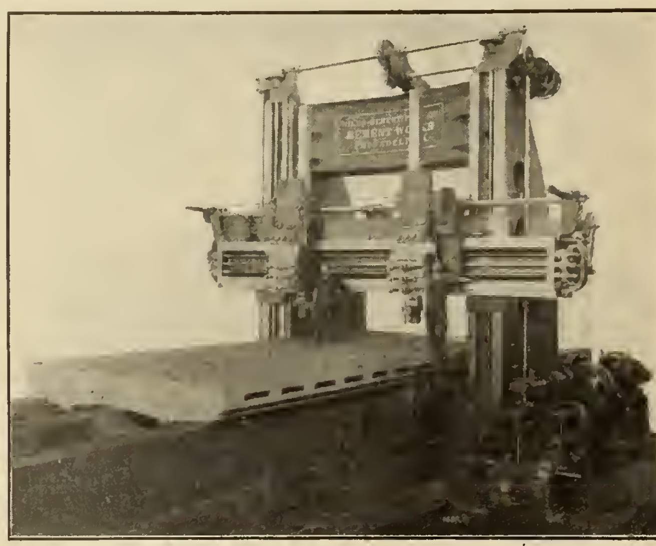


Fig. 3—Planer Completely Erected.

pinions are forged directly on the shaft being cut half-pitch apart, in order to give smoothness of motion.

Fig. 2—An indication of the Size of Planer.

Among the many other new features, not the least is the pneumatic feed.

Cross Head Feed.

The feed for the cross heads is very clearly shown in Fig. 4. On the side of the upright just above the gearing is a cylinder with piston rod extending to the left. This rod carries a rack which meshes into a gear near the bottom of the vertical feed shaft. This shaft has on its lower end, a bevel gear meshing into another bevel gear on a horizontal shaft which transmits motion to the vertical feed shaft on the left-hand upright. The movement of these feed shafts is constant at all times and variation in amount and direction of head feeds is obtained by adjusting the connecting rod in the slotted cranks on the ends of the cross-slide. These cranks are graduated in such a way that definite cross and vertical feeds can be obtained and by using at the same time the cranks on both sides, an angular feed can be given to the tool, which is at times desirable, as the whole heads were not designed to swivel. The valve for controlling the air to the feed cylinder is thrown automatically at each end of the stroke, this movement being taken from either the main driving gear train to the table or the slotter gearing, when slotting is being done. To throw out the feed, it is simply necessary to close a valve, cutting off the air supply.

In Fig. 4 the feed for the table, when slotting or transverse planing is being done, has not yet been placed in position, but it is shown in Fig. 3, directly in front of and at the base of the upright. This feed operates practically the same as the feed for the cross head previously described, except that variation in stroke or amount of feed is obtained by an adjustable stop which regulates the amount of movement of the piston in the cylinder. This adjustment is made by the right-hand hand wheel the left-hand hand wheel for connecting and disconnecting this feed mechanism to the main driving works.

Fig. 1 shows the slotter drive and Fig. 5 shows it in more detail. The description of the main drive on the opposite upright fits this one up to and including the pneumatic clutches. For the main drive, the power is then carried through the upright into the bed while for the slotter drive it is, as shown, transmitted to the vertical square shaft and thence by levels and spur gearing to the horizontal square shaft running along the top of the cross slide. The pinion on this shaft drives the large gear of which, however, only the cover can be seen and the rack pinion which gears into the back of the cutter bar is on the same shaft with this gear. The pinion on the square shaft slides and can be thrown in or out of gear as desired, so that either or both bars can be used. The disc shown just above the motor controls the length of stroke. This disc is driven from the main train of slotter gearing and the adjustable stops in its periphery can be set at any desired point and effect the reversal in the same way as do dogs on the side of a planer table. Near the bottom of the square vertical shaft in Fig. 5 may be seen the bevel gear on the end of a horizontal shaft which goes across the bed and which can be connected to the mechanism operating the valve of the feed cylinder on the opposite side, as mentioned in the description of the feed for the heads.

Control Mechanisms.

In Figs. 1, 3 and 4 can be seen a vertical shaft where the reversing hand lever of a standard planer is usually found. It will be noticed that there are two sockets at the upper end, in one of which is a handle. The upper socket is connected to a shaft which runs down to the bottom lever or crank. This is the hand control of the slotter. The method of connection can be followed quite clearly starting, as shown in Fig. 3, going through the bed and coming out on the opposite side, as shown in Fig. 1, and then by the curved

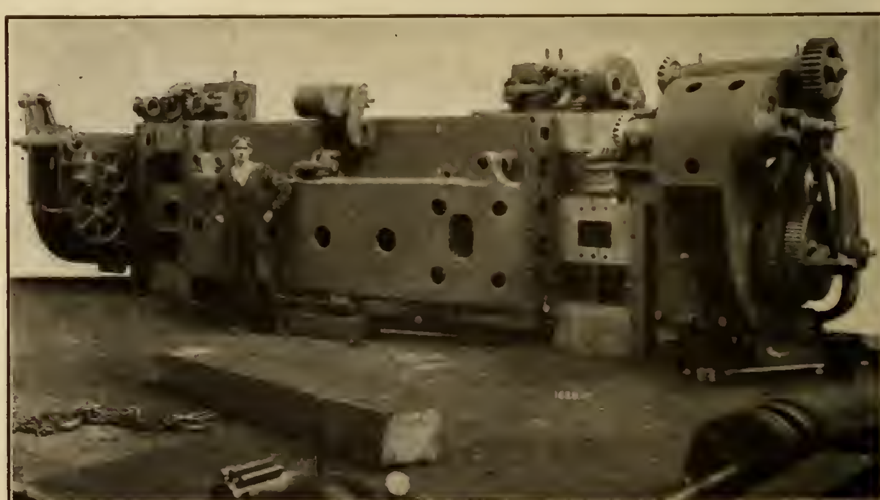


Fig. 6—Showing Back of Cross Rail.

connecting rod running in back of the upright and out through the upright to the slotter reversing mechanism at the reversing disc.

The lower socket is the one that controls the movement of the table when regular planing is being done and is connected by lever and rods to the reversing dogs on the bed on both sides. Only one handle is furnished for each side and thus mistakes arising from throwing the wrong lever are avoided.

Points About Table.

Owing to the great weight and large dimensions, it was impracticable, both from a manufacturing and shipping standpoint, to make the bed or table in one piece. There were, therefore, divided to bring them within reasonable limits. The central section of the bed is divided longtitudinally into three parts and the two end sections into two parts, or seven parts in all. The total weight of the bed is about 275,000 lbs. The table is made in two sections divided longtitudinally in the centre and weighs about 140,000 lbs.

The holes in the table for stop bolts, etc., run entirely through the upper plate while below this is a second plate without openings extending the full width of table for catching all chips. The chips can then be removed through the side openings of the table, which are clearly shown in Figs. 1 and 3.

The motor for fast traverse of heads is shown on the end of the cross slide in Fig. 4. The reversing is done through friction clutches and a safety is provided which prevents throwing in the fast traverse and the feed mechanism at the same time.

The motor for operating the rail is situated at the top of the upright, as shown in Fig. 3 and 4. This motor is connected at all times to the elevating screws and is stopped, started and reversed electrically.

On the end of the table, in Figs. 1 and 3, are shown finished pads over the V and flat ways. These are to carry the heads for truing up the ways when worn out of alignment. The method is as follows:

The table is raised, say, ¼-in. above the ways and supported in this position on sliding blocks fitting the inner small auxiliary-shears, which are used only for this purpose. The truing heads being fastened to the end of the table, the ways are trued up from the centre to the end. The heads are then placed on the opposite end of the table and the remainder of the ways finished. Near the centre of the bed are pockets in the ways in which these same truing heads are placed and the table is in its turn then planed up in the same manner. The accuracy, of course, of the finished work is dependent entirely upon the accuracy of the small auxiliary ways, and these, are, therefore, finished and erected with great accuracy.

The elevating screws for cross slide are firmly held top and bottom and the nut in the cross slide acts into a shouldered end in square pocket. It is expected that this will take care of the slotter bar thrust satisfactorily, but if any loosening or trouble is experienced, arrangements have been made so that the slide can be firmly braced to the uprights.

Fig. 3 shows clearly the double rack drive and the outer flat way and central V. It will be noticed that the table extends down a short distance inside of the flat ways to prevent any possible side movement of table under heavy cuts. The auxiliary ways for supporting the table when truing the main ways are shown just inside of the flat outer ways. The right and left-hand construction of the heads for bringing slotter bars close together, and counterweighting of tool slides is also clearly shown.

Fig. 6 shows rear view of cross slide, illustrating very clearly the feed gearing at the end, the tumbler bearing for one of the cross heads which are shown projecting above the slide near the ends. A single tooth pinion, operated by a worm and worm wheel, for holding the slotter bar in its extreme high position, or drawing it out of the way when using the machine as a regular planer, is shown.

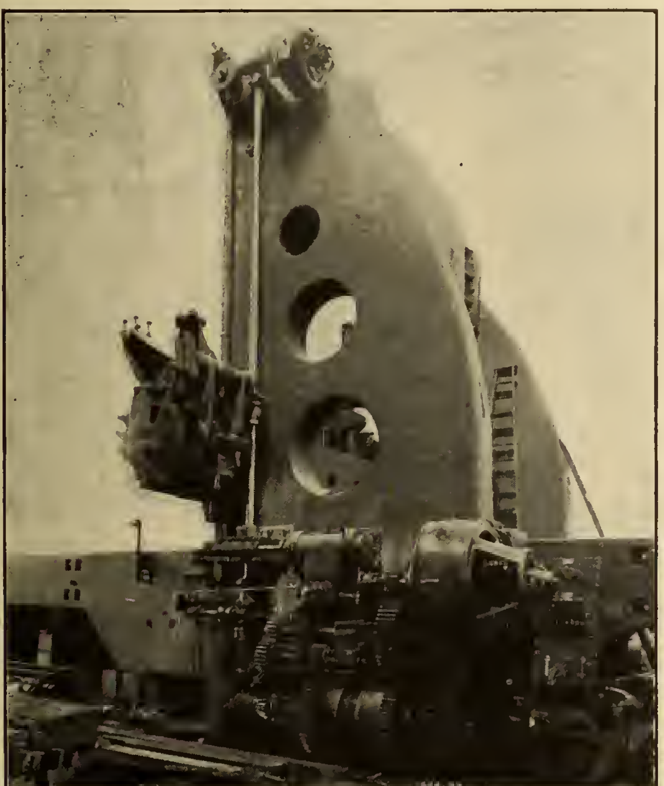


Fig. 4—Main Drive by 100 H.P. Motor.

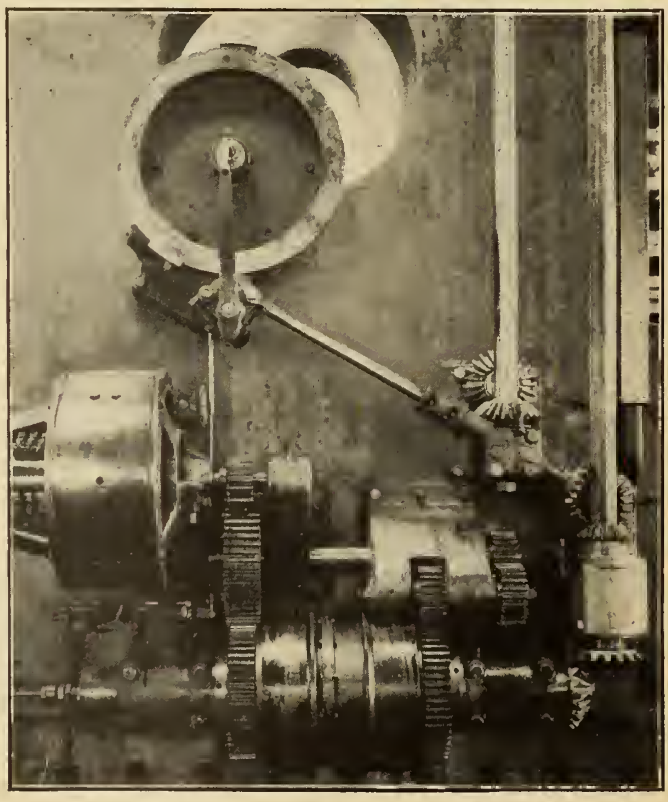


Fig. 5—Showing the Slotter Drive.

An Economical and Practical Machine Shop Cost System*

Describing a Simple and Effective Shop Cost System for Machine Builders, the Forms Used, and Its Installation in a Factory

BY B. A. FRANKLIN

Without attempting, except here and there, to discuss the rightness or reason why certain expenditures are classed in the particular way they are, I assume as axiomatic that modern conditions and success demand cost systems, as surely as rain demands umbrellas. Without pretending that it is the best possible system, or the only right one, let me say that it covers the whole situation, gives the maximum amount of bulk information, and is susceptible of being developed in as much or as little detail as seems desirable.

Situation Covered by Cost System.

The cost system shown covers an iron foundry, a wood-working shop, a machine shop and an assembling shop. The plant in which it operates is not a large one, having about 150 employes, and doing a business of about $400,000 a year; and yet it is believed from experience that the system is an elastic one applicable—with changes not radical—to a large plant.

Basic Principles.

A first advantage is that the clerical force employed in its operation consists of but two men, the bookkeeper and assistant, and these two do all the work illustrated, including the regular duties of bookkeeping, billing, pay-roll, etc., and keep it strictly up to date without overtime work. This is mentioned because the bugaboo of the practical man's consideration of a cost system is the clerical expense attached to it.

A second advantage is that it is a practical man's cost system because it presents the facts in condensed and understandable figures and the details can be had as desired.

A third advantage is that though it took eight months' time to develop into practical and running shape, its present condition and operation are as routine as the operation of the power plant, and it has grown to be just as important.

A fourth advantage is that, being kept through the books, we can and do know that it is right within practical and provable limits.

This system was built on certain definite principles:

The first and most important of these principles was that to get the cost of machines, the practical way was to get the cost of the whole and all machines and develop the part or detail cost as desired or essentially necessary; not to get all the detail costs and throw them together to get the whole cost.

The second principle adopted was that the cost should be gotten up in such a manner as to be provable as correct. This involves getting the cost of everything done in the factory.

The third principle adopted was that the costs of the whole should be presented in a condensed manner to the executives, and always where possible, in comparison with previous similar machines or parts, the detail to be presented on demand only. The detail is gathered and recorded in such a manner that this is not difficult.

Divisions of Cost.

The costs and, indeed, all recorded facts in bookkeeping and records are gathered along four main divisions or under four main heads:

1. Material. By material here is meant only that material which becomes a part of the finished machine. All other material not a part of the finished machine is classed as expense.

2. Productive Labor. By productive labor is meant only that part of the pay-roll which pays for work actually spent in shaping the machine to its finished condition.

3. Factory Expense. By factory expense is meant all that money disappearing or leaving no permanent asset in supporting and advancing the career of productive labor in shaping material into the finished product. This expense, as will be seen later, is proportioned to each machine in ratio of expense to productive labor by departments.

4. Selling Expense. By selling expense is meant all money spent in disposing of the production to buyers, reducing the gross sale price to a net income to the factory. This expense is shown in a per cent. relation to gross sales.

The showing of the cost of a machine gives the material used in desired detail, the productive labor by departments, the factory expense by per cent., additions to the productive labor of each department, and the selling expense by additional of a per cent. of the selling price. These, added together, make the total cost.

Divisions of Expenditure.

Having fixed on these four main elements, we set about gathering them and applying them in a simple, systematic and routine manner.

The first elements attacked were the third and fourth—the factory and selling expense. These elements we decided to gather entirely through the bookkeeping, and to show therein the proper per cent. relation of factory expense to productive labor and of selling expense to sales.

This led to an arrangement of the

DATE IN VOICE	VOUCHER No.	NAME	ITEM	DATE PAID	MATERIAL AMOUNT	IRON CAST'GS	IRON & STEEL	LUMBER	BRASS CAST'OS	SUNDRY MATE'L	PROD. LABOR	EXPENSE	MISCEL.	ACCOUNT
	00													
5/10/07	01	Pay-roll		5 10 07	2202.72						2016.09	184.63		N. P. Labor
4/10/07	02	Johnson Fdry Co	Iron Castings	..	304.17	304.17								
4/28/07	03	Smith Brass Co.	Brass	..	208.29				208.29					
..	04	Kilby Lumber Co.	Spruce	..	2300.00			2300.00						
4/18/07	05	Jones Tool Steel Co.		5 11 07	1800.25		500.03					1300.25		Tool Steel
..	06	Jackson Supply Co.	Files	..	18.00							18.00		Files
4/29/07	07	Wilmot Screw Co.	Screws	..	25.00					25.00				
..	08	Samson Machine Co.	Planer	..	2000.00								2000.00	New Machinery
	09													
	Etc	Etc.							Etc					
	to													
	49													
Total					14872.16	304.17	1000.23	2300.00	208.29	500.00	4020.18	4539.29	2000.00	

Form 1 Voucher Register

* A paper read at the Fortress Monroe meeting of the National Association of Machine Tool Builders.

bookkeeping to fit into the scheme laid out, and it was determined to show these in such detail that the reason and particulars of the per cent. relations should be made plain and of use for critical purposes. Experience has taught us that most concerns think they can do business on smaller per cents of factory and selling expense than they really do, and more particularly that certain expense occurring through the judgment of several men—superintendents and foremen—bear a different aspect as to their necessity and volume when shown in a comparative relation to the whole situation.

We decided that we would make the situation more clear, and less liable to mistake, if at the start all moneys spent were divided into classes just as costs were to be divided, namely; material, productive labor, factory expense and selling.

We therefore introduced a form of journal called the Voucher Register.

Form 1 illustrated this, and the entries made tell their own story. Every cent expended in the business for any purpose whatsoever goes through this book, so that we know that nothing is missing. The Miscellaneous column at the far right is for certain money spent which cannot be considered as immediately chargeable into the four elements named, such as permanent assets, additions to the plant, machinery, etc., or exchange accounts, as note payments, etc.

It will be noticed that we divide the expenditures for material into certain main divisions, as iron castings, iron and steel, lumber, brass castings and sundry materials. This is in order, as shown later, that as the material is used and reported we can keep on the books a dollars and cents perpetual inventory of it in sufficient detail to show value of raw material on hand monthly; and by checking with actual inventory, show where and how much error has been made in reporting material used.

After the material accounts in this voucher register, Form 1, will be noted Productive Labor. The pay-roll is divided into productive and non-productive labor, and the non-productive labor is out under the head of factory expense.

After the productive labor comes Expense. All items whatsoever of expense are placed in this column; and in the final column, called Account, is placed the name of the expense. Once a month, as will be seen, the footings of these columns prove with the total of money spent, and one posting a month gives all the information it is designed to gather on these points.

Once a month this expense is analyzed and shown in Form II., Expense Analysis.

ITEMS	INVENTORY EXPENSE SUPPLIES	JANUARY 1907		FEBRUARY 1907		ETC.
		ACTUAL	USED	ACTUAL	USED	
GENERAL EXPENSE						
Office						
Executive						
Cost and Bookkeeping						
Other Clerical						
Stationery						
Postage						
Telephone						
Telegraph						
Legal						
Sundries						
Total						
Drafting Room						
Draftsmen						
Supplies						
Total						
Factory						
Executive						
Clerical						
Storeroom						
Cleaning Up						
General Labor						
Inward Cartage and Freight						
Inward Express						
Total						
Shipping						
Labor						
Lumber						
Supplies						
Total						
Tool Room						
Files						
Drills						
Hack Saws						
Emery Wheels						
Taps						
Cutters						
Reamers						
Tool Steel						
Labor Sharpening Tools						
Labor Making Tools						
Total						
Supplies						
Oils						
Electric Lamps						
Sundry Supplies						
Total						
Grand Total General Expense			4000.00		3444.00	
Monthly Productive Labor			8000.00		8200.00	
% Expense to Productive Labor			50%		42%	
Average % Expense to Productive Labor					45.8%	
Amount to Department 1	In proportion to productive labor of		2000.00		2500.00	
" " " 2			1000.00		1250.00	
" " " 3			1000.00		1250.00	
POWER						
Labor						
Coal						
Water						
Oils						
Sundry Supplies						
Total Power Cost			300.00		325.00	
Share to Department 1	Divided in proportion to use		50.00		54.16	
" " " 2			150.00		162.50	
" " " 3			100.00		108.34	
Depreciation						
Taxes						
Insurance						
Total						
Share to Department 1	Divided in proportion to value of investment in department		300.00		300.00	
" " " 2			400.00		400.00	
" " " 3			300.00		300.00	

Form II. Expense Analysis.

Expense Analysis.

The expense analysis is the practical man's detailed view of two elements of the four factors of cost, namely, factory expense, its per cent. relation to productive labor, and selling expense and its per cent. relation to sales. Each month's per cent. of factory expense and selling expense is shown as a separate unit; but since the per cent. used in

a practical cost cannot be one varying constantly, we run in all cases the "period per cent." or the average per cent. of the months to date.

This period per cent. after some months settles down—except in cases of violent change of condition—to a definite level and is the per cent. used for cost figuring. If the per cent. in the average does vary violently, I think it not unfair to say that something may be wrong in the conduct of the business and the increase or decrease of this period per cent. is a very good guide point toward advantageous or deleterious conduct. These per cent. relations are definite and easy means of adding these elements of cost to any order, machine or part; the analysis gives a quick, detailed and comparative knowledge of why this per cent. varies, why it is so large, and very quickly, as time progresses, places the trouble.

It is a fact of many businesses that great attention is paid to material costs, that labor costs are carefully watched, but expense is not so carefully watched; because each expense in itself and at its time of expenditure—bears the stamp of judgment of someone (too often Tom, Dick or Harry) and seems a proper or possible allowance, but does not show in relation to the whole which it should do. This expense analysis, very readily and quickly gotten once a month, also shows definitely the cost of certain departments of expense, as designing, office, tool room, etc., and almost always leads to reductions.

The variation of per cent. shows also in one figure the progress of costs up or down; for instance, in times of slack production, it is known—but not often reckoned with—that the per cent. of expense goes up. This method shows why, and offers the detail for criticism and reduction. It is not too much to say that the expense is more frequently a larger element of cost than productive labor in the machine-building business, yet productive labor gets large consideration and expense a smaller one. I have often heard the complaint that a given per cent. of expense was too large, or inaccurate, or not truly representative. This method proves the per cent. shown to be correct whether satisfactory or not as to size.

In the expense analysis, most of the items are the result of direct expenditure and bear little chance for criticism as to their proper placement under the head of expense. The items most disputed about were non-productive labor and depreciation. In the matter of depreciation there have been conceived many and detailed plans for the proper addition of this just charge as a cost item. At best the figure assumed is a guess; but the guess is based on a desire to charge off a sufficient sum yearly to balance, in the long run, that sum of money necessary to be expended to keep an up-to-date plant by proper replacement or changes. In this case about 5 per cent. of the total investment was taken as being safely above that need in the plant, and one that the business would permit.

No other assumed charges were put to expense; all such items as interest on investment, etc., were considered as cared for in the per cent. of profit added in making up the selling price.

In the matter of non-productive labor, every labor item that could not be fairly and justly distributed against an order number was called non-productive, and put into expense, and thus equally divided over all orders. This non-productive labor was shown in considerable sub-division.

It wil be noted that there are for each month two columns in the expense analysis. One column represents the actual expenditure; the other represents the amount chargeable to the particular month. For example, taxes and insurance are paid generally once a year; to get a fair monthly per cent., they are pro-rated 1-12 to each month in the year. Supplies may be bought in such quantity as will last several months. When they are reported as used, the used amount can be set down as a charge against the month in which they are used. A little thought will show that this method permits a dollars and cents perpetual inventory if the amount on hand at the beginning is set down.

In the plant in which this system is in operation, this expense analysis brought forth several decided economies as well as elucidating the expense situation. It compelled a thorough reorganization of the tool-room system, since it showed that an unexpected amount of small tools was being bought. It made a considerable reduction in non-productive labor. It brought out the fact that much useless overtime was being paid for. It brought about a changed and more economical purchase and distribution of supplies.

Department ________ Week Ending ________

NAME	NO.	RATE	TOTAL HRS.	TOTAL DAY WORK	TOTAL PIECE WORK	TOTAL PAY	NON PROD. LABOR		ORDER 7216		ORDER 7320		ORDER 7115		ETC.
							HRS.	AMOUNT	HRS.	AMOUNT	HRS.	AMOUNT	HRS.	AMOUNT	
John Jones	28	$25.00 Wk.		25.00		25.00		25.00							
B. Smith	29	25 ¢	58	14.50		14.50				7.50		7.00			
T. Jackson	30	30 ¢	62	17.40		17.40				5.40					
S. Samson	31	20 ¢	58		15.72	15.72			30	7.50		6.00		6.00	
P. Brown	32	15 ¢	58		8.70	8.70		8.70					32	8.22	
Etc.			Etc.					Etc.					Etc.		
Total				279.36	72.89			62.50		28.10		25.00		14.22	Etc.
Expense 120%										33.79		30.00		17.06	Etc.

Form III. Pay-roll Book

		C REPAIR	CLASS C	B REPAIR	CLASS B	A REPAIR	CLASS A	MISCEL.	DATE	ITEM	ORDER NO.	MISCEL.	IRON CAST'GS	IRON & STEEL	LUMBER	BRASS CAST'GS	SUNDRY MAT'L	
							15.00			Iron Castings 500 Lb.	7125		15.00					
				6.00						Brass Castings 20 Lb.	7187					6.00		
										100 Bolts ⅝ x 2½	7289						7.00	
						1.00				200 Ft. Spruce	7016				4.00			
					Etc.		4.00						Etc.					
		20.00		17.05	16.05	1.17	25.25			Total			22.10	7.18	17.00	26.12	10.10	

Form IV Material Journal

Productive Labor.

Having settled the method of two elements of cost, i.e., factory expense—the third and fourth items—we next proceeded to the second elements, productive labor. Here, by use of a time-note system, which need not be gone into at this time, we turned the pay-roll by

means of Form III. into a means of gathering and proving the productive-labor costs.

This method may seem complicated where there are many orders. In this plant, where there was an average of 100 different orders per week in each department, it proved simple and economical. It also offers many advantages:

1. It proves the labor charges, non-productive and productive, to equal the total pay-roll, nothing can be skipped.
2. It permits gathering the total labor on an order very readily, since we merely take the footings of the columns.
3. It shows a picture of the department labor, and permits a quick reference to the detail of any labor at any time without wading through a lot of time notes, which may have gotten misplaced before the information was desired, as in the case of non-productive labor showing too late on expense analysis—which might demand investigation.
4. It also offers a means of adding to each order its per cent. of expense in each department in a simple and sure way.

In fact, it is as complete and concise as the facts can be shown.

Material Used.

Having gathered productive labor, factory expense, and selling expense, we come finally to the first item—record of use of material. This is accomplished by means of Form IV. This material is gathered through storeroom and foremen's reports.

You will notice that in this form, as well as in all the forms, there is nothing complicated or complex to understand. We do in form and figures exactly what takes place in fact. We establish certain definite material accounts, and as, in fact, there are taken from the piles of material certain amounts which go to make a certain class of machinery, so we credit on the books the particular class of material with so much money and charge it to the class of machinery. So, at any time—but particularly at the end of the month—we have our totals of credits to material and charges to machinery to use in the books and the detail to put to the order cost.

This offers us a ready means to check the use of material, since beginning with an inventory of raw material and adding constantly the purchases and deducting the use, we have a figure showing what material should be on hand. An actual inventory shows the degree of accuracy and error.

Order Cost.

Having thus established regular methods of gathering and recording material, productive labor, factory expense and selling expense, we now come to the final assembling of these facts. This leads, of course, to the establishment of a proper order system, and this order system was established on two principles:

1. An order for all work done for sales purposes.
2. An issuance of orders in such manner as to give the desired or useful information.

The final cost of the order, compiled from the recorded facts, is shown in detail on Form V., and in a condensed way in a small book, Form VI. They tell their own story. The condensed form is for the manager, who did not want to be digging through the detail, but asked for it when he wanted it, and who did want to know the fluctuations of cost.

Form VII. shows how all this information is gathered together into the final accounts, which are cast up each month, giving the true situation. It may be well to note that these accounts show the complete situation.

Description ___Machine A1

DATE	IRON CASTINGS	IRON AND STEEL	LUMBER	BRASS CASTINGS	SUNDRY MATERIAL	PROD. LABOR	FACTORY EXPENSE	SELLING EXPENSE	TOTAL COST	SOLD FOR	REMARKS
2/10/07	73.27	14.00	20.00	3.00	10.25	30.25	36.30	13.75	200.82	275.00	
3/28/07	74.65	13.75	20.00	3.00	9.50	40.06	49.14	13.75	225.17	275.00	Hard Iron

Form VI. Manager's Order Cost Book

Patt. No. ______ Order No. ______ Weight 100 Lb.

		COST PER LB.
Metal Cost		0.0112
Molding Labor	50%	0.0050
% Expense Added	80%	0.0040
Cleaning Cost		0.0015
Expense Cost		0.0040
		0.0257

	DR.	CR.
QUICK ASSETS		
Cash		
Petty Cash		
Bills Receivable		
Accounts Receivable		
MATERIAL ON HAND		
Sundry Stock		
Brass Castings		
Lumber		
Iron and Steel		
Iron Castings		
PERMANENT INVESTMENT		
Real Estate		
Machinery		
COST UNFINISHED CONTRACTS		
Class "A"		
" "B"		
" "C"		
" "D"		
" "E"		
" "F"		
GENERAL PROFIT AND LOSS		
General Expense Undivided		
Interest and Discount		
Income on Investments		
Class "A"		
" "B"		
" "C"		
" "D"		
" "E"		
" "F"		
Profit and Loss		
FOUNDRY PROFIT AND LOSS		
Sales		
Metal		
Productive Labor		
Expense Used		
Expense Undivided		
LIABILITIES		
Capital Stock		
Surplus		
QUICK LIABILITIES		
Accounts Payable		
Bills Payable		

Form VII.

Description – Repair 14" Lathe   Order No. 7125

DATE	ITEM	FOLIO	IRON CASTINGS	IRON AND STEEL	LUMBER	BRASS CASTINGS	SUNDRY MATERIAL	PROD. LABOR	FACT'Y EXPENSE	SELL'G EXPENSE	TOTAL COST	DATE	ITEM	SELLING PRICE
4/2/07	Iron Castng 202 lb.		6.06											
4/3/07	Brass Bushing 10 lb.					3.00						4/4/07		20.00
"								2.75	3.30					
										1.00				
			6.06			3.00		2.75	3.30	1.00	16.11			20.00

Form V Order Cost

	16.11
19.9% Profit	3.89

	Mon.	Tues.	Wed.	Thurs.	Fri.	Sat.	Week
MELTING							
Pig No.1							
Pig No.2							
Pig No.3							
Pig No.4							
Bought Scrap							
Coke							
Coal							
Limestone							
Cupola Supplies							
Labor							
Total Metal Cost							2016.00
Lb. Good Castings Produced							180,000
Cost per Lb.							.0012
Period Cost per Lb.							.001
MOLDING							
Molding Production							
Coremaking Production							
Helping							
Flask Fitting Labor							
Flask Fitting Material							
General Labor							
Sand							
Coal							
Sea Coal							
Miscel. Supplies							
Total Molding Cost							1350.00
Lb. Good Castings Produced							180,000
Cost per Lb.							.0075
Period Cost per Lb.							.0073
Total Molding Prod. Labor							
Total Molding Expense							
% Expense to Prod. Labor							83%
Period % Expense to Prod. Labor							80%
CLEANING							
Labor							
Supplies							
Total Cleaning Cost							450.00
Lb. Good Castings Produced							180,000
Cost per Lb.							.0015
Period Cost per Lb.							.0016
GENERAL EXPENSE							
Executive							
Power							
Depreciation							
Taxes							
Insurance							
Freight and Express							
General Labor							
General Supplies							
Total Expense							720.00
Lb. Good Cast Produced							180,000
Cost per Lb. Expense							.0040
Period Cost per Lb. Expense							.0039
	HISTORY						
Total Lb. Melted							240,000
Lb. Scrap Used							120,000
% Scrap Used							50%
Lb. Good Castings Produced							180,000
% Good Castings to Total Melt							79%
Period % Good Castings to Total Melt							75%
Lb. Bad Castings							5,000
% Bad Castings							2.8%
Period % Bad Castings							3%
Lb. Spruce							
Lb. Floor Scrap							
Lb. Loss							
% Loss							4%
Period % Loss							3.8%
Lb. Coke Used							
Lb. Metal Melted to Coke Used							8.1

Form VIII. Foundry Daily Cost and History

1. The quick assets, i.e., cash on hand and accounts receivable.

2. The value of raw material on hand. These figures give the proof of the whole cost system. We know the expense is accurate, because we get it through the bookkeeping. We know the labor is accurate because we prove it with the pay-roll. In the material cost we depend for accuracy upon the correctness of storeroom reports, and foremen's reports where the material is not kept in the storeroom. But by deducting the monthly report of material used, we arrive at these accounts showing material we should have on hand, and an occasional inventory shows us how accurate the reports are.

3. The monthly profit on each line of machinery.

4. The cost of orders in process by the lines of machinery.

5. The foundry profit or loss. In this concern the foundry is operated as a separate plant, selling its product to the machine business at a slight advance over cost.

6. The liabilities.

So the situation is shown completely every month, just as if stock were taken; and the only chance for error lies in the material-on-hand accounts, which are checked occasionally by actual inventory.

In my experience such a condensed and complete showing is seldom made on the books of any manufacturing company. It has proved satisfactory, and with ordinary attention it is difficult for this company to be going backward without getting a quick and sure intimation of it, even apart from the order-cost information. The Information for these accounts is all gathered from the cost system.

Foundry Costs.

Since the foundry is so frequently a part of the machine builder's plant, as it was in this case, we shall say a few words about the method of its cost keeping. Form VIII. illustrates it. It is a daily cost and history. In these terms a literal meaning is to be taken. It is the daily dollars and cents cost, and the facts presented show on the vital points, as production, etc., the history of the day's proceedings.

As will be seen, the costs are divided into the operations of metal cost, molding cost, cleaning cost and general expense, and are so arranged that by getting the exact molding labor cost of any particular casting, and, if desired, the exact cleaning-labor cost, the cost of any one casting can be obtained very readily, as per Form IX.

The practical man will recognize that we have shown the costs in the order of practical shop procedure, and that this method of cost, which requires very lit-

tle time daily to keep up, shows comparatively, day after day, week after week, and in average figures, the cost of castings.

The value of this cost method is its simplicity and its comparative showing, which invariably brings out many weak points, and shows whether they are corrected and the value of their correction. It gives quick warning of any retrogression, falling off in production and increase or decrease of any detail of cost. There are very simple methods of proving its accuracy. It never fails to make economies, and becomes eventually—as indeed any quick and simple cost system does indispensable.

When all is said and done about a cost system, it should give the answer to the questions: What are the results? What has this method accomplished?

It has accomplished, first, an increase of profit due to the fact that the company found itself on some of its work very much in the same position as the druggist from whom an Irishman wanted a bottle. "How much is it?" said Pat. "Empty, two cents," said the druggist; "if I put anything in it, it won't cost you anything." "Then put a cork in it," said Pat. It has brought a right profit on all articles and it was discovered that many articles did not bear such.

The expense analysis alone has saved much money by showing excessive costs in several places, notably in tool room and non-productive labor, as previously stated. The comparative order costs have shown, by connection with the foremen of departments, where economy of labor and material could be made, and much reduction of machine cost has resulted. These economies, though quickly spoken of, came gradually, but were permanent and have meant literally thousands of dollars saved and made. This has all been accomplished with the aid of a bookkeeper and his assistant.

It must not be supposed that all this was readily obtained. It was gotten by development during a period of eight months and with no increase in clerical labor. It took perseverance and effort to get labor and material reported right and to get the work finished in routine and close-to-date manner. Many points arose whereby we had to change plans and methods to meet the shop conditions and to arrange the work simply so as not to take more clerical labor.

HIGH SPEED STEEL TEST.

In many shops the life of a tool does not depend so much on heavy cuts, but rather the wear of the tool at high speed upon a comparatively light cut. We give herewith a table showing a test of the Conqueror High Speed Steel, made in the testing labratories of the Sheffield Testing Works, Limited, Sheffield, England, ona sample of tool steel made in the form of a turning tool received from Messrs. J. Beardshaw & Son, Limited. This tool steel was subjected toa severe test. The usual test is for 20 minutes, but the table shows that this time was exceeded by 50 per cent. Then the cutting speed was increased to run the tool quickly to destruction, and when this object was achieved, the tool was reground. As a result of regrinding the tool accomplished three times the work of a first-class high-speed steel before being done up. Alexander Gibb, Montreal, is the agent for the Conqueror Brand High Speed Tool Steel in Canada.

Marks on Specimen	Description	Form of Cutting Edge	Cutting Speed in Feet per Minute	Depth of Cut in Inches	Traverse per Revolution in inches	Lubricant used	Duration of Test: Mins	Duration of Test: Secs	Weight of Material Removed: Lbs	Weight of Material Removed: Lbs per Min	Condition of Cutting Edge of Tool after test	Material Operated upon
A	1 3/8 sq. High Speed Steel heated to white heat and cooled in cold air blast	Lathe Roughing	40 5	3/16	1/16	None	30	0	49.2	1.64	Good	Steel Bar — Analysis:— Carbon 0.68 %; Silicon 0.126; Sulphur 0.052
"	Test Continued	"	45 4	"	"	"	4	54	9.0	1.84	Done Up	Phosphorus 0.055; Manganese 0.83
"	Tool Reground	"	41 0	"	"	"	62	6	103.1	1.66	" "	

High Speed Steel Test.

THE FALL OF WATER TANKS.

From the number of water tanks falling in the past few months, we should judge that there must be some radical defect in their construction or care. The first defect may be the foundation. Concrete bases should be built on a solid rock foundation, where possible, and a six to ten foot base of concrete on "hard pan" where rock cannot be reached. Hoops may not be of sufficient strength or there may be some defect in the supports or in the steel or wood of the tanks. The fall of a tank is attended with serious loss usually, and insurance companies issue booklets giving specifications for their construction and care.

The life of a wooden tank is from 12 to 30 years, but usually about 15 years but it must be kept well painted and filled with water. It shrinks when water gets low. One advantage of a steel tank if paint is neglected is that a small spot will rust through and show itself, whereas, if a wooden tank is neglected, it may burst the hoops suddenly and cause serious damage.

Hoops require special attention and removal of rust before painting. Particular attention should be given to tanks located on roofs and covered with corrugated iron. The hoops corrode very rapidly on account of the dampness held between the corrugated iron and the staves, and they may be found nearly rusted off in a few years after erection.

If a tank is left empty, the sun and rain will cause the staves to warp and twist so it will be impossible to make the tank water tight afterwards.

One new tank that fell recently was evidently due to weak supports. Another tank removed from a plant a short time ago, was found to be rotted through and managers of factories with tanks cannot take too much care with tanks. Tanks cannot last forever, and careful inspections of tanks should be made each week.

It is false economy for a manufacturer to cut a dealer or builder of tanks to the last cent and think he is saving money. The structural work must be of the best, and the supports sufficiently strong. The builders are working with formulae that are more or less in error as in any structural steel work. A large factor of safety must be allowed to obtain supports to hold the load upon them. The supports, too, must be carefully shielded from the weather and the workmanship must be done with great care. Otherwise there will be more tales to tell of fallen tanks.

G. T. R. ELECTRIC LOCOMOTIVES.

Five Westinghouse single phase engines of 750 horsepower each are being placed in commission at Port Huron by the St. Clair Tunnel Company to draw trains through the Grand Trunk tunnel. Two of them will make a locomotive capable of pulling a 1,000-ton train up the two per cent. tunnel grade. The trip will be made from Port Huron to Sarnia, nearly three miles, in seven minutes.

The Disc Grinder: Origin, and Work Which it Does

The Writer Tells of Origin of Disc Grinder; of its Rapid Development and Broad Application Since Advent of Higher Abrasives

BY F. N. GARDNER

The Disc Grinder.

Up to within a very few years, the mention of a disc grinder to mechanical engineers or machinists usually brought out the question, "What is a disc grinder?" and even now the name conveys a very hazy idea of the machine and of the practice of disc grinding to a majority of manufacturers and men in the metal trades. This being the case, a brief description of the idea and its development to date may be in order.

A "disc wheel," so called is a circular metal plate—preferably made of soft steel—with abrasive cloth, or paper—such as emery cloth and paper—cemented to its flat sides. This metal wheel, or disc, so covered with abrasive grains is mounted at end of a rotating spindle. Work is pressed against the flat abrading surface of the wheel, and a finished flat surface is formed on the work.

Origin of Disc Grinding.

In 1890 it was up to me to devise a method of finishing, rapidly and cheaply, pieces of flat bar steel. These pieces were ½ inch x 1½ inch x 2½ inch to ¾ inch x 3 inch x 6 inch. The pieces were to be finished all over, edges, ends and sides. They were to be practically flat and straight, and all angles to be right angles, and to have a nice finish that would look well after case hardening. The selling price of the article would not admit consideration of milling and afterwards finishing the pieces.

It was then that I conceived the idea of disc grinding, and worked it out to a commercial success on that particular job. The first wheels were made of cast iron, and were about 12 inches diameter x ½ inch thick, and were faced with common commercial emery cloth and paper, which was the only obtainable thing on the market at that time. The wheels were run at speed of about 2,200 R.P.M. The work supported on a plain table set square with face of wheel, was pressed against the wheel "free hand," i.e., no holders, levers or gauges were used. The success of this trial and the efficiency of the "disc wheel" soon called for further development in the way of sliding and swinging tables fitted with gauges and angular adjustment, and led to the building and putting on the market of a new type of machine tool which was called the Gardner Grinder. It was built for using disc wheels exclusively. I was unable to obtain a basic patent on the wheels for the reason that the use of emery paper gummed to the face plate of a lathe was not new, consequently the patents granted to me covered only special and minor points, and were easily evaded. The consequence was that several machine builders came out with disc grinders within two or three years after my patents were granted, and at present there are a large number of concerns building them, both in the United States and in Europe. It would doubtless be a conservative statement to say that there are several thousands of disc grinders now in use, and that all in a large measure are modeled from the old Gardner Grinder of 1890.

Rapid Advancement After 1904.

Comparatively small advance was made in development of disc grinder or practice of disc grinding previous to 1903-4. This was largely on account of their being limited to the use of commercial emery cloth and paper for facing the wheels, but with the advent of what might be called the "higher abrasives," such as "Carborundum," "Adamite," "Alundum,", etc., the field for the practical and economical use of disc grinders in a great variety of manufacturing operations has been vastly enlarged. The case with these new abrasives is quite similar to that of high speed, or air hardening steel as used for lathe tools, drills, milling cutters, etc. It is well known that the use of these steels has practically revolutionized the design of machine tools. To obtain the full efficiency of the new "high abrasive," it became necessary to practically redesign the disc grinder.

Three years ago it was easy to name a limit to size of work that could be done with the disc grinders then in use, but that limit has since been rapidly widened, and I am constantly surprised by hearing of work that has been taken away from milling machines, shapers, lathes, etc., and is now being done with disc grinders at a greatly reduced cost.

Disc Grinder for Continuous Area Grinding.

Possibly the greatest point for consideration in the use of disc grinders is the question of the solid—or continuous—area of surfaces to be machined, and the amount of stock to be removed. The common practice is to leave about 1 1-16 inch—generally more—of stock for each milling or plainer cut. This is all wrong for disc grinding. Pieces to be machined on a disc grinder should be made "in the rough," with just as little stock to be ground off as possible. It will take a good deal more than eight times longer to grind off ⅛ inch than to grind off 1-64 inch. It is a common and successful practice when castings are to be machined with a disc grinder to make patterns exact finished size—with shrink rule of course—and allow that rapping and swell of castings will give enough stock to grind to size.

I am told by several manufacturers that by cutting their patterns down where "finish" was formerly left, and by reducing the large solid areas by ribbing or grooving, they are now getting the same pieces finished for less than the castings formerly cost them. That is to say, the saving in weight of the castings more than pays for the labor of machining with a disc grinder. The flanges of automobile gear and crank cases have to be machined to a practically true and flat plane. These cases are made just as light as possible of cast iron, aluminum, brass or pressed sheet steel. They are all sizes up to approximately two feet square, or one by three feet. Such pieces are extremely difficult to hold without springing, and to machine with anything except a disc grinder—but with a disc grinder it is very easy. The case is pressed against the side of the disc wheel, bearing practically all over the surface of the flange it adjusts itself to the wheel, the high spots being ground off first, and when it is ground down to an all over bearing, it is as true as the face of the wheel.

Throughout the practice of disc grinding, it is very seldom necessary to rigidly clamp or fasten the work. In fact, such fastening should be avoided, if possible. Fixtures and holders should be designed to allow rapid handling of the work. As a general rule work should not be in contact with the wheel under grinding pressure to exceed 20 to 30 seconds. It is much better to have the holders so arranged that pieces can be handled quickly, and not grind long enough at any time to over heat the piece, but allow it time to cool and then handle again as many times as is necessary to produce the required size or finish. This, of course, applies to regular manufacturing where a considerable number of duplicate pieces are being machined, but in all cases it should be remembered that disc grinding is dry grinding, dry grinding generates heat, excessive heat tends to distort the work and glaze the wheel.

MACHINE SHOP METHODS AND DEVICES

Unique Ways of Doing Things in the Machine Shop—Readers' Ideas and Opinions Concerning Shop Practice Useful Data for the Machinist—Contributions paid for.

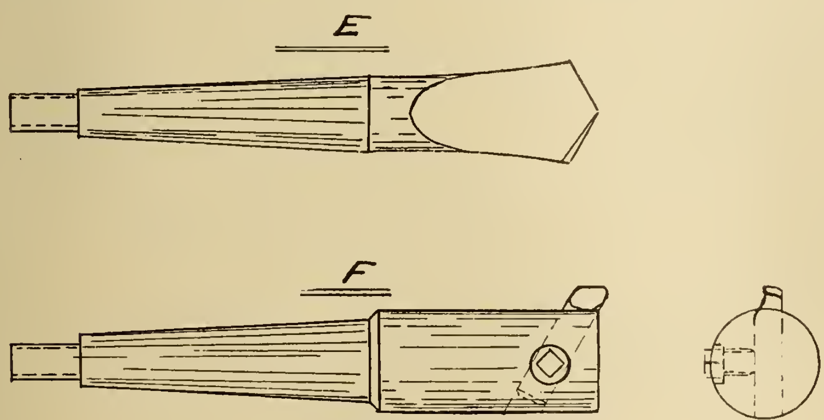
MACHINE JIGS FOR REAMING.

By C. H. Jennings.

In the construction of large jigs for drilling and reaming machine frames, the accurate location of bushings is not always obtained without an element of uncertainty and in order that this would be practically eliminated the following method was devised and proved of such value that it was universally adopted not only for tool work but machine work when gears entered the construction:

The tool referred to was designed to bore the frames of somewhat intricate machines having a system of fine pitch gearing that must run without back-last and with the minimum amount of power, the holes first to be bored and then bushed with hardened and ground bushings driven in position. To make the job more difficult the casting was too large to be handled on any machine but "the old boring machine." This, in days past, had been regarded as well made. Once in its history or perhaps a number of times the bar had been sprung, so much in fact, that an arbor fitting it would describe something like a one-inch circle ten inches from the end of the bar and to correct this error produced a "stop and think" spell and it was finally decided to use the following method:

Referring to the sketch, the taper socket A made from soft steel fits the machine for receiving a No. 3 Morse taper and tapped at the inner end. The cast-iron collar B was forced on and the socket driven home in the bar, the collar was then turned true and to fit the sleeve D. This was turned with a sleeve rest bolted to boring machine plate, the socket was not removed until the jig was finished.



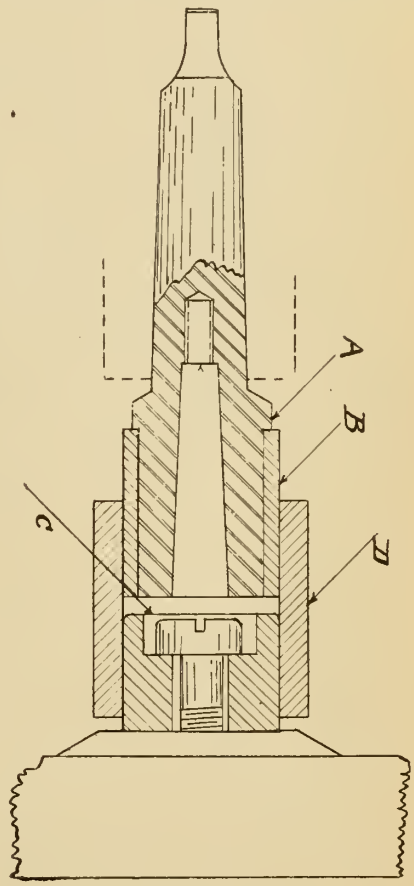
Machine Jigs.

Seven buttons C had been made of cast-iron and neatly turned to same diameter as B, having a half-inch hole and the ends square with the outside. Tools E and F are fitted to taper and threaded to enter tapped hole in taper socket A. This method of holding tapers was questioned by the foreman who finally consented to its use. When the tools had been finished and the feet and bosses of casting planed to dimension, it was placed on a surface plate and the holes approximately located, drilled and tapped with a three-eighth's tap and the buttons placed in exact position by returning it to the surface plate. This was done with a vernier height gauge exercising every precaution as the final results depended on the correctness of this setting.

After all the buttons had been properly placed in position the casting was returned to the machine, firmly strapped to plate and adjusted until the sleeve would slide without the slightest interference from B to C. C was then removed and the hole was rough drilled and then bored with F in three cuts. No attempt was made to ream as it is a mistake to ream well-drilled holes for jig work as it is absolutely necessary to grind each bushing to the hole it is driven into, therefore a departure from the standard size cannot be regarded as bad workmanship when position and alignment are of such importance.

The holes were all drilled and bored in this manner and when finished were plugged and sent to the inspector who pronounced it "within a hair." As a matter of fact, it was within .0005 of the dimensions furnished. While this may look to some as a long method for this class of work, yet the tools are simple to make and with them the final results are well worth the trouble, and if care is used, cannot be other than a credit to the man who makes the jig and a satisfaction to the firm that is looking for profitable small tool equipment.

Special reference to the cast-iron collar B would perhaps be well and that this may be understood, would like to say that this is used for the correction of any defect that may exist in the machine spindle and it is quite unlikely that any machine is sufficiently accurate to omit this or some other method of trueing the socket. For good work this collar should be renewed each time the socket is used and always turned in the position it is to be used.



Machine Jigs.

The parts B and C could be made from steel, hardened and ground, and if the amount of work will warrant, this would be no objection. However, the cast-iron parts have been used for some time and if well used will last for years. While I cannot say that this is altogether an original idea of the writer I have never

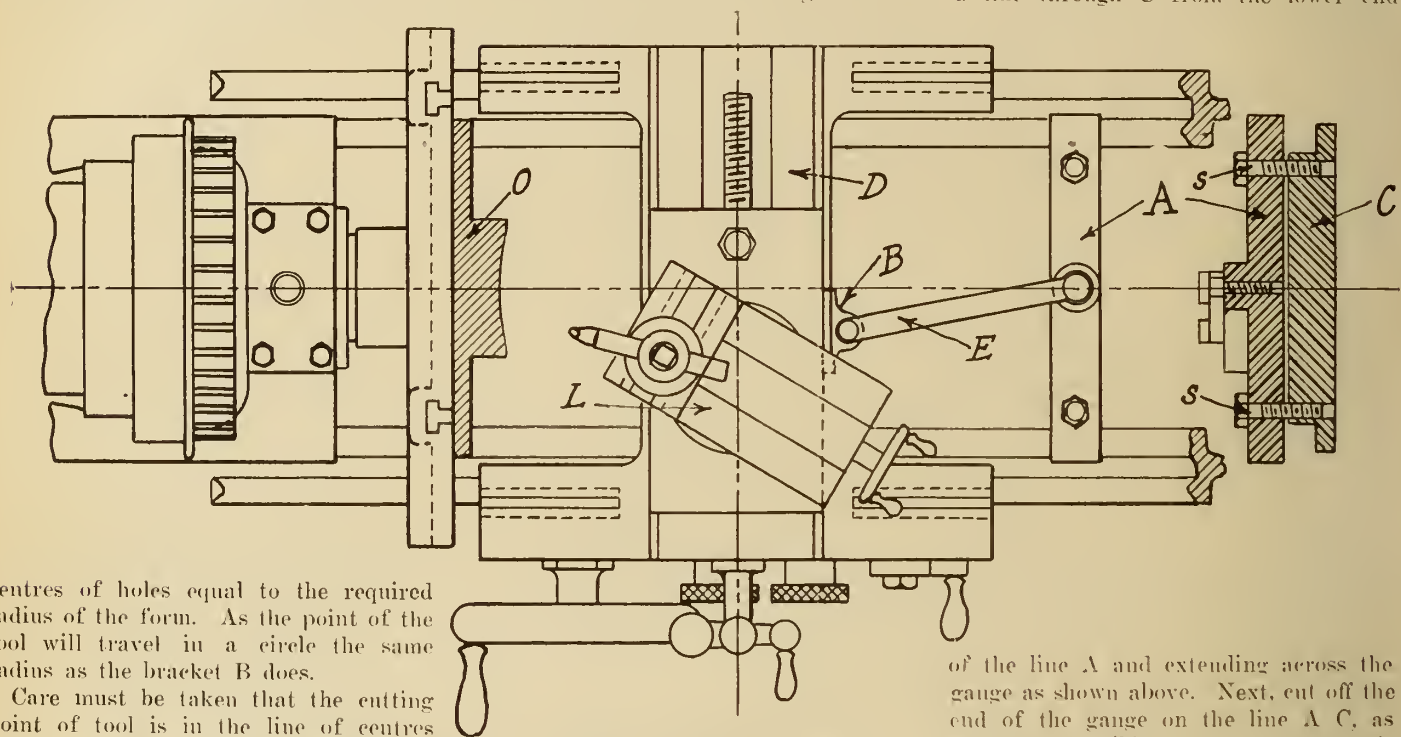
known of its use in other shops and if in use I would like to hear other comments referring to its use.

TURNING CURVED SURFACES.

By Alex. Rouse.

Convex and concave surfaces can be conveniently and quickly turned in a lathe jig. Herewith is a sketch which shows a die-bed O, bolted to the face plate, and a concave surface similar to that shown must be turned on the boss or form.

The gig shows a cross piece A bolted to the shears of the lathe by the clamp C, with two screws, S, S. A small bracket B, is screwed on to the cross slide of the saddle D. Connection is made between A and B by the strip E, which must be the length between the centres of holes equal to the required radius of the form. As the point of the tool will travel in a circle the same radius as the bracket B does.



Turning Curved Surfaces.

Care must be taken that the cutting point of tool is in the line of centres when the centre of bracket B and cross-piece A are also in the centre.

Adjustment should be made by sliding piece A, up with the saddle to the work, and then fastened down, allowing saddle to move free. Further adjustment can be made with compound rest L.

Different length of strips could be used for different radii or an adjustable strip could be used.

To the right is shown an end view of the jig.

CLEARANCE GAUGES FOR SQUARE THREAD TOOLS.

By E. S. Cooper.

When a job of chasing a square thread that is part of a machine and a regular output of the shop then it is well worth the time spent in making a solid gauge. In this connection I am not taking into account the large shop with an up-to-date tool-room, but the smaller ones in which it is usual for each man to make the special conveniences himself that may be needed for the jobs he regularly does.

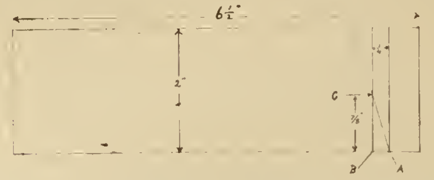


Fig. 1—Clearance Gauges for Square Thread Tools.

This making of a square thread tool gauge was found to be a very simple thing. The first one I ever undertook to make I thought must certainly be made of steel and that took so long that it seemed a great waste of time and after that they were always made out of a piece of tin or galvanized iron by means of a pair of tinsmiths' shears.

They were all made 2 in. wide and 6 in. long with a ½-in. hole punched in one end to hang them up by, and each one had the diameter and pitch of thread for which it was made marked on the side and looked like Fig. 2 when completed. This gauge has one advantage over the adjustable one: It can be turned over and used as a gauge for the clearance on the back side of the tool, whereas the adjustable one cannot be used for that purpose without resetting it, on account of the adjustable wing projecting below the body of the gauge and preventing it from being set on the same plate as the tool. Supposing an odd job comes in requiring a square thread 1⅛ in. diameter, 4 threads per inch, which is ¼-in. pitch, and you want to make a clearance gauge for it. Take and cut out a piece of tin 6½ in. long 2 in. wide, cutting it as parallel on the sides as possible.

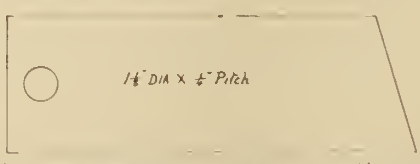


Fig. 2—Clearance Gauges for Square Threads.

Referring to Fig. 1, take a square and scribe the line A, ½-in. from the end and another line B, ¼-in. from A. Now mark off on B a point ⅞-in. from the lower edge of the gauge and then scribe a line through C from the lower end of the line A and extending across the gauge as shown above. Next, cut off the end of the gauge on the line A C, as exact as possible and your gauge is finished. Five minutes will do the job at any time. When your thread cutting is done, punch the hole and stamp the size of the thread on it and you have the gauge complete, ready to hang up and looking similar to Fig. 2.

The explanation of the manner of laying out this gauge may be of use to the youngest element and is as follows: In this particular thread the pitch is ¼-in., being 4 threads per inch, and in all cases the two lines A and B must be laid off a distance apart that is equal to the pitch of the thread to be cut. The distance from the lower edge of the gauge to the point C must always be equal to the diameter of the bottom of the thread. The mistake is often made of making this distance to the point C the same as the outside diameter of the thread but this is decidedly wrong. The pitch of the thread is the same at the

bottom as at the top, and being of less diameter calls for a greater angle of clearance. The difference is easily shown by laying out the two angles as in Fig. 3.

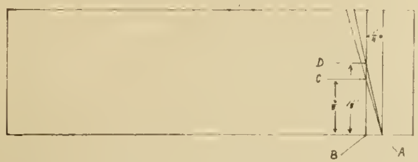


Fig. 3—Clearance Gauges for Square Threads.

In Fig. 3 lines A and B, the point C and the line drawn through C from A, are the same as in Fig. 1. Now mark off the point D on the line B 1⅛ in. from the lower edge of the gauge, and through the point D draw a line from A. The different angles of these two lines will show you that a threading tool made with a clearance to suit the angle A D would not have sufficient clearance by the time it reached the bottom of the thread where the clearance is required to be greater and must be made to suit the angle representd by the line A C.

The use of such gauges as described enables a tool to be made with just enough clearance to cut nice and clean and at the same time have all the metal possible left in it. This adds not only to the strength of the tool but the increased amount of metal more easily carries away the heat from the cutting edge, which is a point often overlooked in the grinding of iron cutting tools.

On page 49 of the November issue of Canadian Machinery is explained a method of obtaining the clearance necessary on a tool for chasing square threads. I have found that the type of gauge shown is convenient for an odd job when that particular pitch and diameter may not be met with again in a long time. I think the articles on gauges will be of considerable interest to practical shop men.

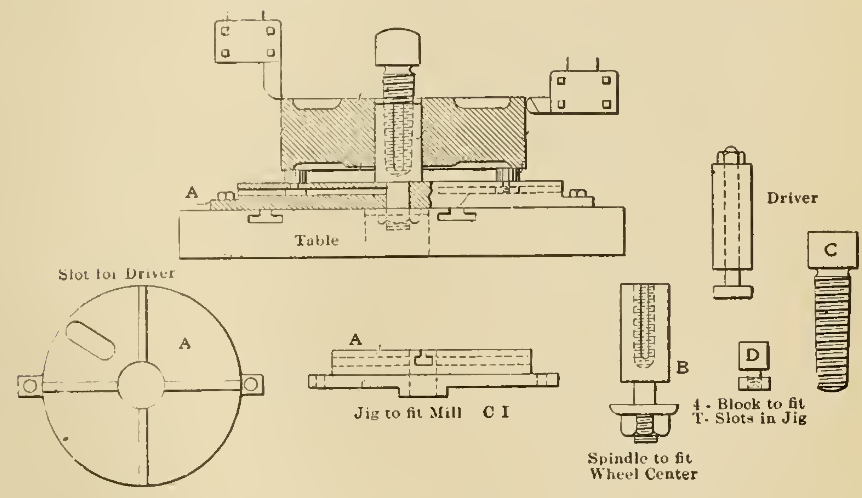
TURNING WHEEL CENTRES FOR LOCOMOTIVES.

By E. A. Wood.

The accompanying cut represents a device I made for finishing locomotive-wheel centres on a 48-inch boring mill. The wheels are first put on the mill, one side faced, bored and reamed to 3 3-4 inches. This is the size of spindle B, which has a slot cut in to allow it to expand when tapered screw is forced in. Set-screw C is then tightened down, which holds the wheel centres firmly upon the spindle. Four blocks are adjustable in T-slots of the auxiliary table for blocking up the wheel centre and have square nuts running in slots.

The wheel rests on these blocks, finished side down, which brings the wheel true on the bottom side. The driver is then placed through a slot in the jig or auxiliary table, with a bolt in the slot of the boring-mill table, which holds the wheel from turning on the spindle.

By using this jig the wheels are finished on the top side and turned to fit tires at one setting, and in good time.—American Machinist.



TURNING WHEEL CENTERS FOR A BORING MILL

SOME EXAMPLES OF MILLING PRACTICE.

The job described below is a pretty fair example of the practice followed in the Cincinnati Milling Machine Co.'s milling department. The sketch shown in Fig. 1 indicates the general form and gives the over all dimensions of the "angle plate" which is sent with Universal Millers. This is a grey iron casting and is finished all over. It is a very simple piece of work and in a great many respects not very different from a lot of work done in most machine shops.

In Fig. 2 the pieces are mounted on the milling machine table in practically the same manner as they are used when finished. Before this cut can be taken, it is necessary that the bottoms should be milled true. The first operation, therefore, (not shown), consists of finishing the bottom surface with a face mill under a vertical spindle.

In the second operation, Fig. 2, a cut is taken across the two edges and the top surface using a gang of cutters 8 inch, 5¾ inch and 3½ inch diameter. The average depth of a cut is 3-16 inch. The 5¾ inch diameter cutter mills the slot ⅝ inches wide by 1⅛ inches deep from which the T slot for the holding down bolts is afterwards formed. This cut is taken at a table travel of 4.2 inches per minute. The average time for this single operation including the chucking, is 15.6 minutes per piece when made in lots of 50. After this has been done the pieces are set on the table at 90 from the position shown, and another gang is used for milling the ends of the piece and also milling the second slot ⅝ inch wide by 1⅛ inches deep. After this the T slots are undercut by using a standard T slotting cutter 1⅛ inches diameter ⅝ inch wide, held in a vertical spindle. This undercutting is done at a single cut and since the cutter is completely buried in the work, it is necessary that some means be provided for removing the chips, otherwise they would clog the cutter and ruin it in a very short time. It has been found that a jet of compressed air directed into the slot immediately behind the cutter very effectively removes the chips as fast as formed and the milling can proceed at an average rate of about 12 inches per minute. The final finishing of the top surface is done with a face mill under a vertical spindle bringing this true and parallel with the bottom face of the piece.

The above has proven a very economical process. In fact, when this work was formerly done on a planer running at 55 feet on the roughing cut, it required just about twice as much time as it takes at present to do it on the miller.

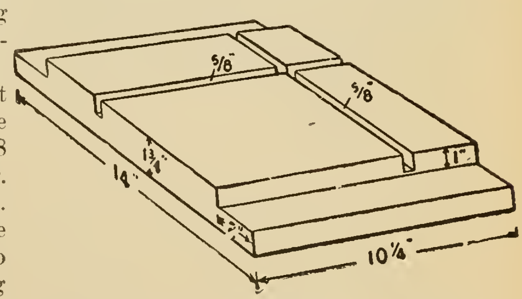


Fig. 1—Some Examples of Milling Practice.

In connection with the operations above described, it must be noted that no matter whether the miller or the

planer is used for finishing, all the edges will be sharp and it is necessary that these should be taken off. A perfectly natural way of doing this and, in fact, the usual method followed, is hand-filing, and in this connection the illustration, Fig. 3, will be of interest. This shows how this work also is done on a miller. A gang of cutters 5 inch, 4 inch and 3 inch diameter, mounted in a No. 2 plain miller, takes off the six corners and also finishes the tongue slot to gauge, and does it very rapidly, the average table travel being nearly 9 inches per minute. Since this is all side and angle cutting, it leaves a smooth finish at this fast feed. It takes just a little more than one minute to take this finishing cut across the piece $10\frac{1}{4}$ inches wide. A similar cut is taken on the other edges of the piece. This is certainly very much quicker, and necessarily more uniform as to accuracy and appearance than could be done by any other method followed in machine shop practice at the present time.

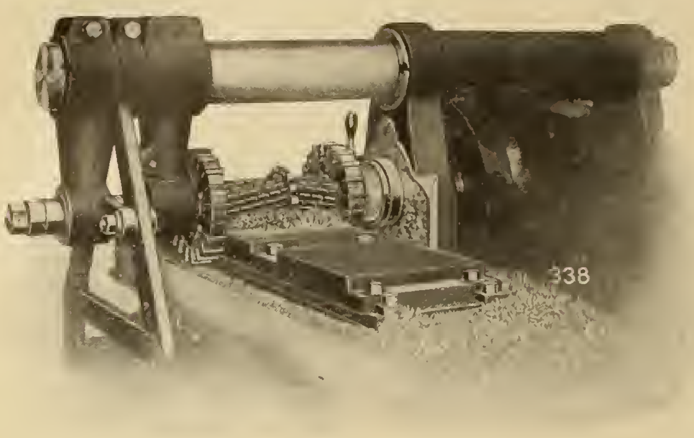
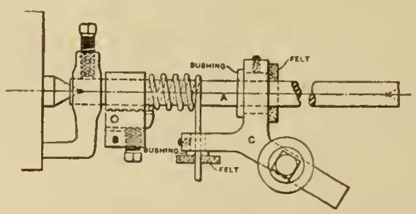


Fig. 2—Example of Milling Machine Practice.

TOOLS FOR WINDING SPRINGS IN AN ENGINE LATHE.

The manufacturing concern by whom I am employed use a great many small compression springs, made of red bronze spring wire, in a variety of sizes and lengths. As it has not been possible to buy springs of sufficiently accurate or durable quality, it fell to my lot to make them on something like a commercial basis, and at the same time without spending much money for tools, as it was hoped we could buy them outside when the demand became greater. It is necessary that these springs be set, or squeezed together once only, after being wound, since they are never compressed again to that extent in service. It is thought that they will then fill the space they are supposed to occupy for a longer period of time. By referring to the accompanying sketch it will be seen how they were wound and compressed, or set. A is the mandrel which is made of drill rod, in a variety of sizes to suit the springs to be wound. Each size mandrel has fastened at one end a piece B in which is pivoted a beveled edge tool steel piece, which in connection with the set screw shown holds the end of the wire being wound.



Tool for Winding Springs in Engine Lathe.

This method of fastening is a great improvement over the usual hole in the mandrel, as the wire never breaks off, as it does with the hole, and the spring can be taken off the mandrel without cutting the wire at that end, as is necessary when a hole is used.

Piece C is a forked piece which is held in the tool post of the engine lathe. One end of piece C is bored to receive guide bushings for the different sizes of wire to be wound. The other end is bored to receive bushings for the different sizes of mandrels. The end which passes over the mandrel serves a double purpose. It acts as a follower rest, making it possible to use long, slender mandrels. It is also used to compress the springs. By releasing the nut from the lead-screw, the lathe carriage can be moved by hand toward the head-stock until the spring is closed up solid, and then released again, and taken off the mandrel, and the operation repeated. The springs are then cut up into short lengths on the punch press, using a stop so that each spring will have the same amount of wire in it. As there was formerly a short piece wasted on each piece wound the saving in winding as long as possible will be apparent. Eighteen per cent. was scrap wire. We now lose less than two per cent. It will be noticed that the holes in the bushings are rounded at the ends, also that pieces of felt kept filled with oil are fastened where the wire and mandrel pass through them to keep from roughing up the wire and mandrel. These little points are very important, as they often spell success or failure for tools.—Machinery.

A rapid method of annealing "Conqueror" high-speed steel, which gives good results on short pieces, such as drill lengths, etc., consists of heating slowly up to a dull red, maintaining there for a period of fifteen or twenty minutes and quenching off in whale oil. Steel after this treatment can be machined easily.—Alexander Gibb.

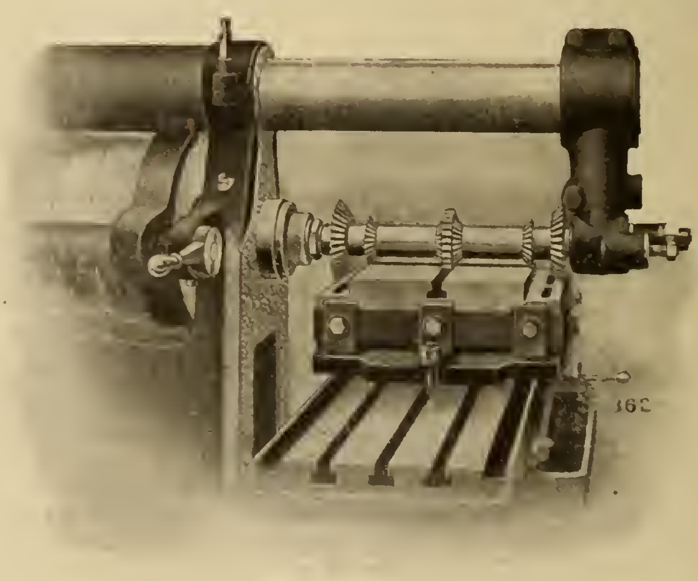


Fig. 3—Examples of Milling Practice.

DEVELOPMENTS IN MACHINERY

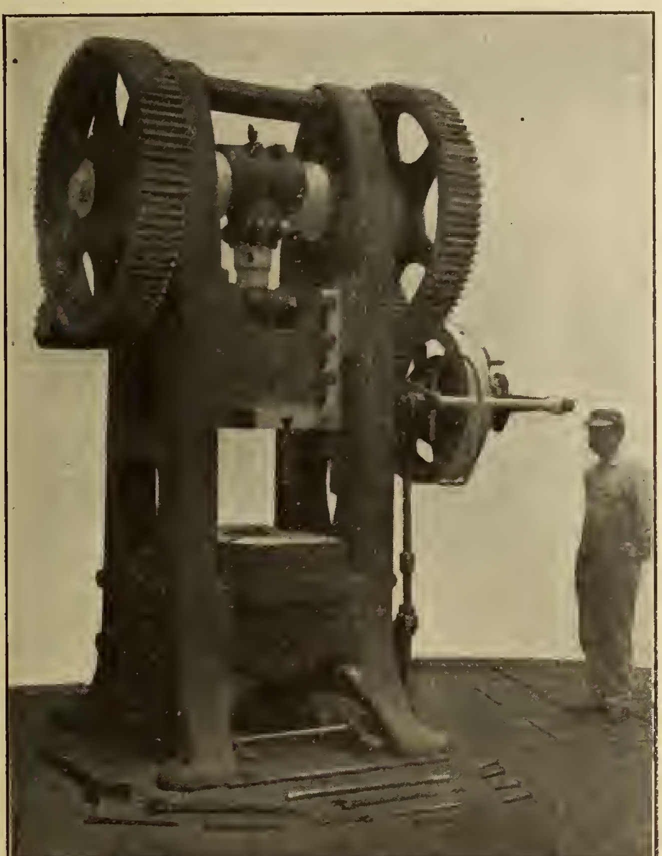
New Machinery for Machine Shop, Foundry, Pattern Shop, Planing Mill; New Engines, Boilers, Electrical Machinery, Transmission Devices.

A NEW SINGLE-CRANK PRESS.

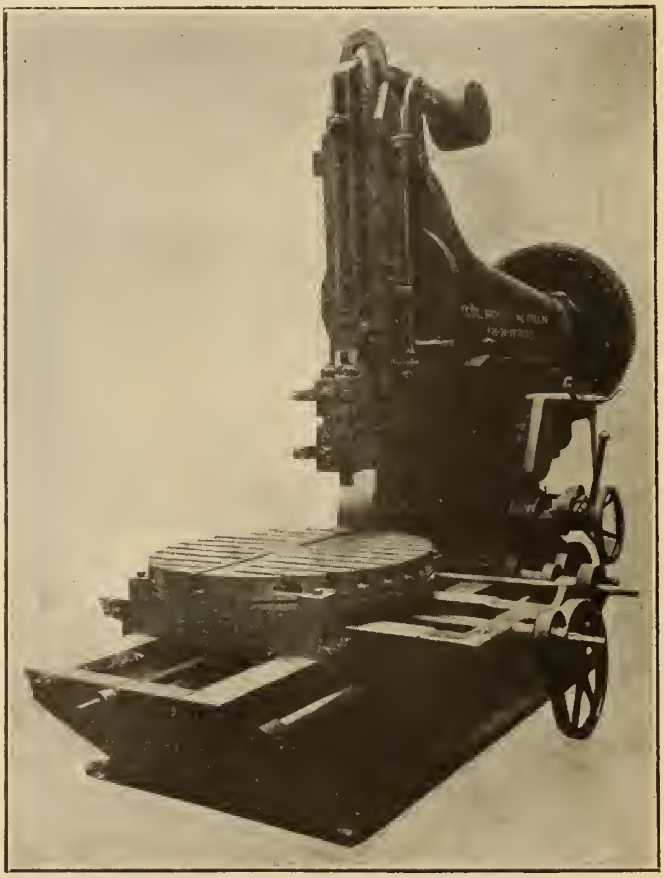
The accompanying illustration shows massive single-crank press with some novel features. The castings which compose the frame are exceedingly heavy and show evidence of careful work in the pattern-shop. Some striking features are the heavily trussed bed and wide-faced twin gears on each side of the press. These gears are cut from the solid. Having two gears on the crank-shaft instead of one tends to relieve the torsional stress of the shaft and affords an even pressure besides dividing the load between them. The back-shaft, with its two pinions which engage the large gears, is a single steel forging made enormously strong to obviate any torsional effect. It provides an equal and even pressure from pinions to twin gears and prevents uneven strains to the frame and moving parts connected thereto.

The main shaft is forged from steel of high carbon. The pitman-stem is six inches diameter and also made of steel. The clutch and fly-wheel are mounted on a stud which is rigidly attached to the frame, thereby preventing any disturbance of alignment which is apt to occur when such supports are detached and bolted to the floor.

The press is equipped with a "multi-disk" friction clutch of a new and effective design. It is of the automatic stop type can be quickly adjusted for stopping the ram by hand at any point of its descent or ascent, or, if desired, can be set for continuous running. Positive knockouts (not shown) are provided, when desired, the press being designed so they can be readily attached.



New Single Crank Press.



New Right Angle Drive Slotter.

The distance between columns is 28 inches; stroke, 3 inches, but can be made, if ordered, any length up to 17 inches; height, bed to ram when up, $19\frac{1}{2}$ inches; adjustment of ram,. 6 inches; fly-wheel, 35 inches diameter and 6 inches face, weighing 750 lbs. The press occupies a floor space of 8 feet 7 inches from right to left and 5 feet 5 inches front to back, and is 10 feet 7 inches high. It weighs 25,000 lbs., and exerts a pressure of 200 tons.

In common with other machines of this nature the press has a long stroke which adapts it for drawing cold from heavy sheet metal, deep drawn seamless shells, automobile hubs, cups for ball-bearings and similar work. It can be built with shorter stroke for heavy blanking, trimming, shearing and embossing. A somewhat larger press of this series recently built by the Ferracute Machine Company for the United States Government is being used in the manufacture of cartridge shells for cannons.

This press has just been built by the Ferracute Machine Company of Bridgeton, N.J., from new patterns after designs of Mr. Oberlin Smith, the president and mechanical engineer of the company.

A RIGHT ANGLE DRIVE SLOTTER.

We present herewith an illustration of a Dill slotter, remarkable on account of the wide range of work this machine will accommodate. The machine illustrated is a 20 to 24-inch slotter, just

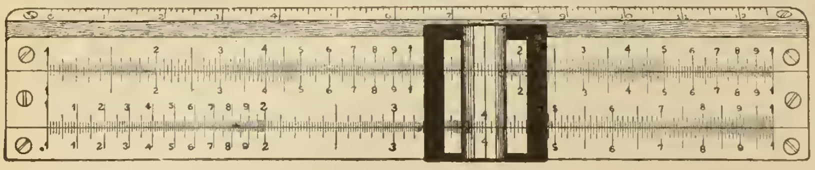
recently gotten out and is termed a right angle drive machine. In this machine the drive is at right angles from the ordinary slotter drive. The cone pulley is shown in the photograph on the opposite side of the machine attached to the other end of the rapid transverse gear shaft. The right angle drive allows the slotter to be set parallel with other machines in the shop where the line shaft runs lengthwise with the shop. The machine does not therefore, use so much space as it otherwise would and heavy work can be readily supplied to it by the traveling crane service.

Another striking feature of this machine is the traveling head and has the advantage that if the work is too cumbersome to be fed to the tool, the tool can be fed to the work. This machine will cut the centre of a 92-inch circle or work on both ends of a piece 108 inches long without a bed. The machine is rigid in construction and the upward thrust incident to the cutting strain is taken by large bolts anchored deep in the bed, running up through the column tying the bed, column and head, the three pieces which compose the frame, rigidly together so that they will resist more tensile strain than if they were one piece.

A quick transverse gear is provided for moving the head and compound table in all directions quickly by power. A stroke indicator tells the amount of stroke the machine is set to and a hand wheel controller arrests the motion after the power is thrown off. The slotter is equipped with a quick return and the feeds are intermittent or continuous as desired. A safety device is arranged for the feed mechanism so that should the head meet with an obstruction or undue resistance while feeding, it will throw itself out of gear without injuring any part. For duplicate work this device can be used to throw out the feed at any predetermined position.

The cutter bar or ram is of the square bearing pattern fitted in an adjustable guide which can be raised or lowered to positions where it can best support the ram. A relief apron, hinged to the ram, allows the use of a long cutting tool. Six changes of speed are obtainable with a one-speed countershaft for the belt driven machine through a three-step cone pulley of large dimensions and a speed box for a constant speed motor.

This line of machines is manufactured by the Dill Slotter People (33rd ward) Philadelphia, Pa.



A New Midget Slide Rule.

"MIDGET" SLIDE RULE.

The Midget Slide Rule is a most convenient and compact slide rule. It is built up of mahogany stock, white facings, engine divided, improved construction with magnifier, and is enclosed in a neat leather case with clasp. Although the dimensions are restricted to only $5\frac{1}{2}$ inches in length, 1 inch in height and weight, including case, does not exceed $1\frac{1}{2}$ oz., it ranks in accuracy and reliability with the larger rules. The ultimate sub-divisions are as fine as those on the regular 10 inch rule, and by means of a powerful and convenient magnifying glass as great accuracy can be obtained as with the larger rule. A set of directions is furnished with each slide rule. This very compact slide rule is manufactured by Kolesch & Co., 138 Fulton St., New York.

THE LO-SWING LATHE.

The Lo-swing Lathe is built for the specialized work of turning shafts, pins, studs and long forgings. It will take work up to $3\frac{1}{2}$ inches in diameter and 60 inches long, with a standard bed and 84 inches on a special bed. The standard lathe is 9 feet $3\frac{1}{4}$ inches over all and is equipped with a constant speed pulley 18 inches in diameter and 3 in. face, running at 560 revolutions per minute. On the front of the lathe is a dial, or speed variator, by which the feed can be varied from 10 to 90 revolutions to the inch of travel. Feeds should be as coarse as the nature of the work and the chip taken will permit. The lathe is designed to do its work with the highest efficiency attainable. As it turns on centres its work is readily transferred; hence it is of importance not only for straight turning work, but for any piece on which there is either straight or taper turning to do, in combination with any other regular or special machine for threading or chucking. The fact that this lathe cannot cut a thread is no disadvantage. The Lo-swing Lathe is a single purpose lathe, turning all diameters up to $3\frac{1}{2}$ inches with as many shoulders on the stock as required.

Fig. 1—Lo-swing Lathe.

A glance at Fig. 1 shows the rigid construction of the lathe and explains how it is possible to take heavy cuts and do accurate work at the same time. Fig. 2 shows a shaft that was rough turned all over from a $2\frac{5}{8}$-inch bar ready for grinding in fifteen minutes.

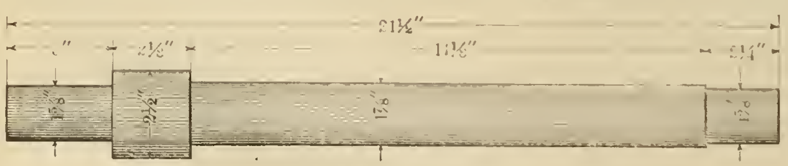


Fig. 2—A Shaft Rough Turned in 15 minutes.

The Carriage.

Fig. 3 shows a sectionl view of the lathe, with tools operating on a piece of work, looking at it from above. There are two rigid and compact carriages which are provided with longitudinal ways at the top, on which the

tool-holders may be mounted in any position. Two or more of these may be used on each carriage if desired, spaced apart by a suitable distance, to give the shoulders required on the work. The pump for supplying the cooling compound to the tools is located in the rear chamber of the head, and can be disengaged, if so desired. The oil is carried from the pump to a passage in each carriage by a flexible piping system. This flexible tubing is used also to supply each individual tool-holder.

An attachment provides for the turning of tapers and the lathe is designed to do turning quickly and accurately. The tool-holder is as close as possible to the cutting edge and the adjustment and setting of the tool is such as to stand all strains, and for rigidity.

This Lo-swing Lathe is manufactured by the Fitchburg Machine Works, of Fitchburg, Mass.

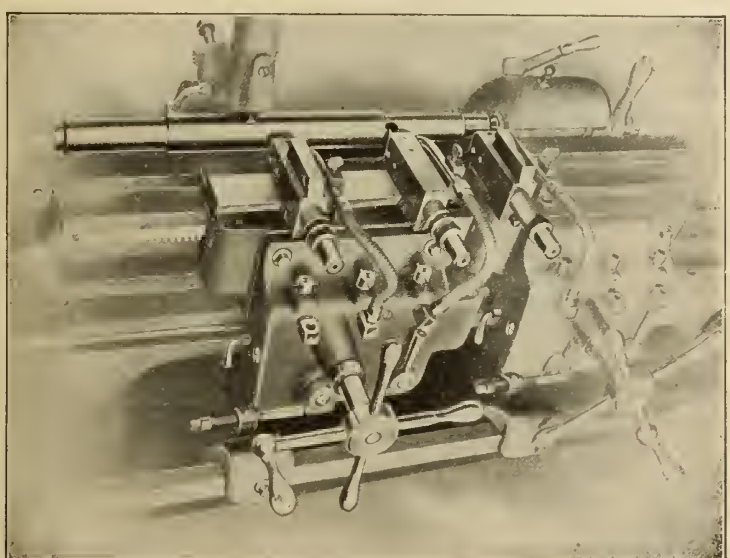


Fig. 3—The Carriage, Showing Tools When in Operation.

TEST OF STANDARD AND BALL BEARINGS.

At the Canadian National Exhibition held in Toronto in September of 1907, Roderick J. Park, consulting engineer, made an independent efficiency test of Chapman double ball bearings, as compared with ordinary standard babbit bearings, for the Chapman Double Bearing Co. The figures for this test have just been completed by the engineer, and he has embodied them in a signed report to the company.

The equipment under test consisted of a shaft supported at each end by the bearings to be tested, these bearings being supported upon standards. Between these two standards two other bearings were placed upon the shaft in such manner as to receive the pressure supplied through the medium of a hydraulic jack operated by a hand pump, and furnished with a pressure gauge reading directly in tons. The shaft was driven by a 15 h.p. motor, belted to it.

A wattmeter was connecter in the electrical current and read the actual power consumed by the motor. The speed of the shaft was determined with a speed indicator.

The first test was made on a shaft equipped with four standard journal bearings, placed as before described, and the second test on four Chapman double ball bearings. During the test the standard bearings were well lubricated, while no oil was used with the ball bearings.

Conducting of Tests.

The two tests were conducted in the following manner :

1. The amount of power consumed by the motor when running idle and without the belt was measured and noted.

2. (a) The motor was belted to the shaft, and brought up to full speed, and measurements of the power used were made.

(b) Pressures of 1, 2, 3, 4, 5 and 6 tons, respectively, were successively exerted upon the bearings by means of the hydraulic jack, and the power used under each of the pressures was noted.

Shaft running idle...............	150w	21.42 p.c. of power for ordinary bearings.
Shaft running 1 ton pressure	500w	45.45 p.c. of power for ordinary bearings.
Shaft running 2 ton pressure	880w	58.66 p.c. of power for ordinary bearings.
Shaft running 3 ton pressure	1,250w	65.78 p.c. of power for ordinary bearings.
Shaft running 4 ton pressure	1,650w	70.21 p.c. of power for ordinary bearings.
Shaft running 5 ton pressure	1,900w	70.37 p.c. of power for ordinary bearings.
Shaft running 6 ton pressure	2,020w	66.88 p.c. of power for ordinary bearings.

Table No. 2.

Results of Tests.

Table No. 1 shows the comparative efficiency of the standard bearings and Chapman double ball bearings.

	Ordinary bearings	Ball bearings
Power for motor alone 350w		
Power for belt and shaft idle	700w	500w
Power to overcome friction at one ton pressure......	1,100w	600w
Power to overcome friction at two tons pressure...	1,500w	620w
Power to overcome friction at three tons pressure—	1,900w	650w
Power to overcome friction at four tons pressure...	2,350w	700w
Power to overcome friction at five tons pressure...	2,700w	800w
Power to overcome friction at six tons pressure....	3,020w	1,000w

Table No. 1.

Table No. 2 shows the actual and percentage saving of power when the double ball bearings were used, the percentages being computed from table No. 1.

It will be noticed that under six tons pressure, the saving by double ball bearings is less than in the other cases. This is due, the engineer reports, to the fact that the shaft in the double ball bearing test bent slightly under the pressure.

The engineer calculated the saving in cost resulting from this saving in power, on the basis of $30 per h.p. per year, and table 4 shows this saving.

Shaft running idle.........	150w saved,	$ 6.03
Shaft transmitting 20 p.c. of its capacity	300w saved,	$20.10
Shaft transmitting 40 p.c. of its capacity......	880w saved,	35.57
Shaft transmitting 60 p.c. of its capacity	1,250w saved,	50.25
Shaft transmitting 80 p.c. of its capacity	1,650w saved,	66.33
Shaft transmitting full capacity.........................	1,900w saved,	76.38
Shaft transmitting 20 p.c. more than capacity	2,020w saved,	81.20

Table No. 3.

More power is lost in friction than the average manufacturer realizes, and these figures, signed by a prominent consulting engineer, should be of considerable interest to them.

FOUNDRY PRACTICE AND EQUIPMENT

Practical Articles for Canadian Foundrymen and Pattern Makers, and News of Foundrymen's and Allied Associations—Contributions Invited.

TWENTY YEARS IMPROVEMENT IN THE QUALITY OF PIG IRON.*

By E. H. Williams and E. R. Sanborn.

At the outset of this paper we would state that its title is perhaps misleading, the idea being, not that the quality of pig iron of twenty years ago was different from that of to-day, but that the control of the manufacture, grading, shipping and use of pig iron, in foundry or steel plant, is much better understood now than formerly.

Nearly all blast furnaces making foundry iron to-day, have chemical laboratories, with chemists in attendance day and night. Careful analyses are made of all raw materials (ores, coke, limestone, etc.), which enter into the manufacture of pig iron, and each cast is carefully analyzed for such elements as are likely to vary. The slags are also analyzed regularly, and, in some cases, the waste gases from the furnace. This all means that the producer is in a position to control definitely the materials which are put into the furnace and to know exactly the character of the pig iron made.

This analytical work, to be of any value, must be carefully conducted by men of experience, which necessarily entails considerable expense, but for which the Furnace Company is amply repaid by smoother running of their plant and by the production of less "off" or bad iron, which they are obliged to dispose of at reduced prices, or remelt. In addition to this gain the Furnace Company is enabled to supply their customers with exactly the quality of pig iron they desire, and they are able to make and deliver iron suitable for all kinds of castings, whether they are to be strong, weak, soft, or hard.

As is well known, before the advent of chemical analysis as an adjunct to pig iron manufacture, foundry irons were bought and sold upon fracture grading alone. This is the case to-day in many foundries, but as the foundryman becomes better acquainted in a chemical way with the irons he uses, the fracture specifications are gradually being superseded by those of a chemical nature.

Iron Graded by Chemical Analysis.

Now what is the reason for this? In our opinion, the answer is, that, in judging the quality of pig iron, grading by fracture is entirely misleading. Irons of widely different chemical analysis have been graded as No. 1, No. 2, No. 3, with the different prefixes of Xs, softs and strongs, and this work, generally, was supervised by a grader, usually a man who had no conception of the foundry business or the use for which the pig iron was intended, simply classifying the pigs by size and color of grain, and the softness and strength by the ease with which they broke on the block. Before the advent of chemistry irons for steel making were classified in this manner, the old Bessemer contracts providing that 60 per cent. of No. 1 and 40 per cent. of No. 2 iron would be accepted, the No. 1 iron being that with open grain, and the No. 2 being the closer grey iron. As the Bessemer process became better understood a phosphorus limit of .100 per cent. was established, this determination being among the first chemical analyses to be regularly carried on, it having been ascertained that irons higher than this in phosphorus made poor steel. Following this the furnace companies began to analyze their irons for other elements at irregular periods, once a month or once a week. Chemical analysis of iron was at that time a slow process. It usually took three or four days for the result to return to the furnace companies from the independent chemists, who made the analysis in their own laboratories, being located often in another town. Thus the iron was nearly always shipped before the chemical results were known.

As the steel makers began to see the advantage of controlling the chemical elements, other than phosphorus, in their steel, they began to buy iron on full chemical specifications, and this soon compelled all blast furnaces, which furnished them with pig metal, to provide laboratories, and awakened the chemists to the necessity of devising quick methods, so that for the last fifteen or eighteen years we have been able to have a chemical analysis for silicon, sulphur, phosphorus and manganese of a cast of pig iron before it was loaded for shipment.

While the steel maker has found that the fracture of pig iron tells him nothing of its quality, nevertheless purchasers of foundry iron have been slow to disregard fracture grading, and up to very recent years little iron has been sold to them upon chemical grading. The reason for this was, probably, that the majority of foundrymen did not know the influence of the various chemical elements upon their castings, and the chemical analysis simply meant nothing to them. A number of the minority began to experiment, and so within the last few years we find more iron being sold on chemical specifications, and think it will not be long before the fracture grading will be entirely extinct. It is nearly so at the present time.

As an instance of the fallacy of fracture grading: We have had many casts of iron piled in our yard varying in silicon from 75 to 3 per cent., and in sulphur from .009 to .050 per cent., thus differing widely in character. It would be impossible for an expert to select from these irons, by its fracture, a cast approximating a certain chemical analysis.

If silicon and sulphur largely control the hardness and softness, strength and weakness of cast iron, these instances show the absolute fallacy of grades by fracture.

We have not touched upon the phosphorus and manganese content of foundry pig irons, as within ordinary limits they do not affect the fracture, and as the absence of these elements in the iron depends entirely upon the amount of them carried by the ore mixture. They are therefore, uniform in any furnace using the same ore mixture, and foundrymen can specify the percentage of these elements required and feel reasonably certain of getting pig iron uniform in these elements. The silicon and sulphur are entirely controlled by the operation of the furnace.

Neither have we dwelled upon analysis for graphitic carbon and combined carbon, as it is now generally understood that the determination of silicon, sulphur, phosphorus and manganese are all that are required to properly classify pig iron for foundry use.

Chemical Grading is Exact.

We have gone to considerable length to show the fallacy of fracture grading, as its use gives to the foundryman an iron of extremely indifferent character, while chemical grading is exact and irons of similar character can always be duplicated. Thus the control of the finished product has been improved. Without going into detail as to the improvement of blast furnace practice since the advent of chemistry we need but to say, that while formerly off iron was common, it is now possible to have a furnace make an immense tonnage without the failure of a single cast. A furnace run-

* A paper read before the Foundrymen's Association at Cleveland, Ohio.

ning on Bessemer iron in the Chenango Valley had an entire year's product, nearly 100,000 tons, without a cast of pig iron over .050 per cent. in sulphur, which is the Bessemer limit for this element. Another furnace made over 50,000 tons without an off cast, and it is not common at well managed plants, particularly those that use good fuel, for the off iron to exceed 2 per cent. of the entire product. In an operation so crude, and yet so sensitive, these remarkable records are only attained by the careful selection and control of the raw materials. We all know that in the early days of pig iron manufacture in the South, it was extremely difficult to get iron there running under 5.00 per cent. in silicon, because of their lean, easily reduced ores and the large amount of fuel that they used. The chemist has shown them how, and now it is possible in the South to produce irons running uniformally under 1.00 per cent. in silicon for the basic process to high silicon softeners for the foundry.

There is no question but that our fathers made good iron. We make as good with the further advantage that when we sell a man a carload that is particularly good, and he analyzes it, he can come back and find its duplicate.

In the foregoing we have endeavored to show that the application of scientific principles to the manufacture of pig iron has brought during the last twenty years a vast improvement in the control of its quality. The application of the same scientific principles to the mixture of various irons in foundry practice, will do as much to improve the uniformity of the quality of castings, and to enable a foundryman to make mixtures which will give him definite characteristics to the various castings which he seeks to produce. We would further call attention to the fact that for blast furnace companies, the lower grades of iron, low in silicon, relatively high in sulphur, and low in graphitic carbon, or in other words, close grained, mottled and white irons, are produced more cheaply than the higher grades.

We believe that the time is coming when the foundryman will buy more of these cheap irons, and by the judicious use of alloys in the cupola, air furnace, or by adding to the molten metal, produce castings that are just as adaptable as those made from the higher grades of iron alone.

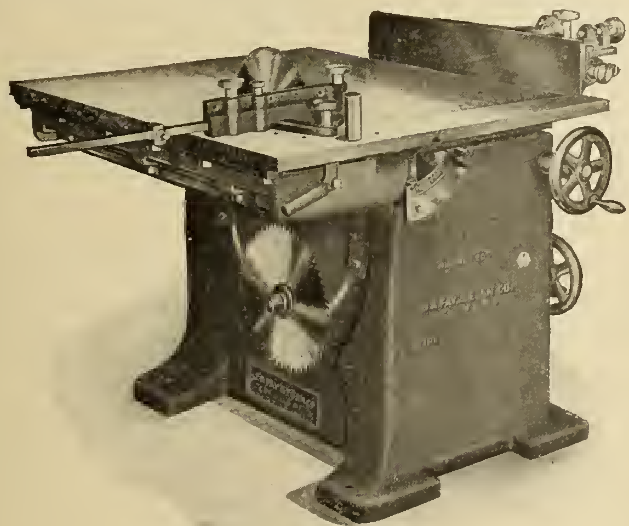
PREPARING FOR THE CONVENTION

Active steps are now being taken in preparation for the holding of the annual convention of the American Foundrymen's Association in Toronto next spring. A committee is being formed from the various bodies interested in the convention, such as the civic authorities, the Canadian Manufacturers' Association, the foundrymen's section of the Employers' Association, the Board of Trade and the local foundrymen. This committee will have been formed soon after New Year's Day, and will get down to work.

It is expected that this convention will be one of the largest in the history of the organization; and Canadian foundrymen should do their utmost towards the success of the convention. They should attend in large numbers, and show the people from across the border what an enterprising industry is the foundry industry of Canada.

Dr. Richard Moldenke, secretary of the association, will be in Toronto early in January, and will be busy making arrangements. H. M. Lane, secretary of the Foundrymen's Supply Association, will also come to Toronto early in the year, and will practically take up his residence in that city until after the convention. He will make all arrangements for the large exhibit made by the Supply Association in conjunction with the convention.

DOUBLE CIRCULAR PATTERN SHOP SAW.



Double Circular Pattern Shop Saw.

The Universal Double Circular Saw shown in the accompanying cut is designed to meet the requirements of a modern cabinet and pattern shop. The frame is a massive casting, heavily ribbed throughout to resist all strain. Both saw arbors are carried on a revolving frame whose bearing at the front consists of a circular plate 20½ inches in diameter by 1¼ inch face, set in a turned seat in the front of the column and secured by a set of gibbs. This feature does away with the outside support and wall of the column in front of the saws. By using this revolving plate, the front of the column is entirely closed, keeping the mechanism inside free from saw dust.

Two saws up to 16 inches in diameter one on each arbor, can be carried at the same time and the frame revolved, or if one saw is used it may be as large as 20 inches in diameter. The placing of a plate between the saws and the driving pulley makes the revolving frame very rigid. The revolving frame has a cap bearing at the back securely bolted to the column. This bearing is 2 11-16 inches in diameter and 3 inches long. The saw mandrels are 1 7-16 inches in diameter in the bearings and 1 3-16 inches where the saws are applied.

The table is made in two sections, a moving section 44x16 mounted on frictionless rollers, which will open to permit the use of a 2 inch grooving head and a stationary section 44x20½ inches, which has an extension so that material up to 20 inches in width can be ripped. The rollers under the moving table are held in a frame and run on a track adjustable for wear. This section of the table can edge or cut off material up to 35 inches. The whole table can be tilted to an angle of 45 degrees from the saw by a hand wheel operating a worm and gear connected to the table, a gauge on the column registering the angle.

A ripping fence may be set to rip stock up to 20 inches or at an angle to cut semi-circle core boxes at any size. On the stationary table is a stamped index for the use of the ripping fence. Two universal fences are furnished with the machine and a micrometer on each permits fine adjustments being made. A mitre cut off fence covers a range from 45 degrees back of the fence to 60 degrees in front. Stop rods regulate the different lengths of stock.

This Universal Double Circular Saw is manufactured by J. A. Fay & Egan Co., Cincinnati, Ohio.

Patterns for Repetition Work; Economical Work Distribution

Paper Presented before the American Society of Mechanical Engineers, Taking up the Expenditure Allowable in Repetition Pattern Work, Etc.

BY E. H. BERRY

A pattern which is run continuously for months, or perhaps years, clearly falls within the limits of this paper as being used for repetition work. And it is just as clear that one which is discarded after a single casting has been made from it should be classed as a pattern for jobbing work.

The exact point which marks the division between them depends, in a large measure, upon the size of the foundry and the kind of work it handles, and the two classes frequently merge into each other by imperceptible gradations. Without attempting to fix specific limits, we can use the extreme cases cited above to indicate the lines along which the distinction should be drawn, leaving each pattern user to decide for himself as to the precise position on the scale which he assigns to any given pattern.

It is this position which usually determines the expenditure that can be permitted in making the pattern, for it is evident that a cost which would be perfectly legitimate for making say, a million castings, might be excessive if only ten thousand were required, and entirely prohibitive for one thousand. On the other hand, the circumstances might be such as to justify a high pattern cost, even for a small number of castings, as for instance, in the case of certain master patterns, further reference to which will be made elsewhere in this article.

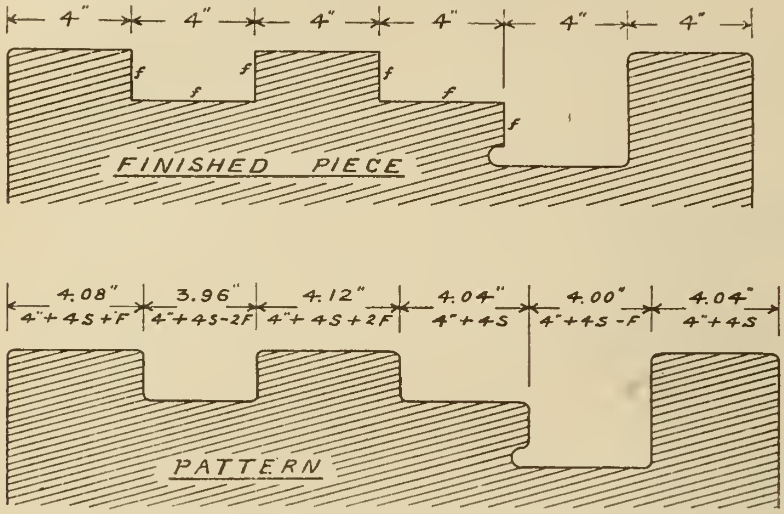


FIG. 1 ALLOWANCES FOR SHRINK AND FINISH

Many of the conclusions reached in this paper may be borne in mind to good advantage even in the case of jobbing patterns. But the very nature of the service for which these are intended is such that the designer must leave most of the details to the judgment of the pattern maker; and if the latter fails to catch every important point, it simply means that the molder may have to spend some additional time in producing the desired casting from the pattern furnished him. For whatever use the pattern is intended, the problem resolves itself into a question of distributing the total work in such a way as to attain the greatest economy in the final result.

TABLE 1 MINIMUM DEPTH OF FLASK

SIZE OF FLASK IN INSIDE MEASUREMENTS	MINIMUM DEPTH OF FLASK GIVING A COPE THAT CAN BE LIFTED	APPROXIMATE DEPTH OF COPE HALF OF MOLD
9 by 16 inches	3 inches	1½ inches
10 by 18 inches	3¼ inches	2 inches
12½ by 17½ inches	3½ inches	2¼ inches
13½ by 15½ inches	3¾ inches	2½ inches
14 by 23 inches	4 inches	2¾ inches

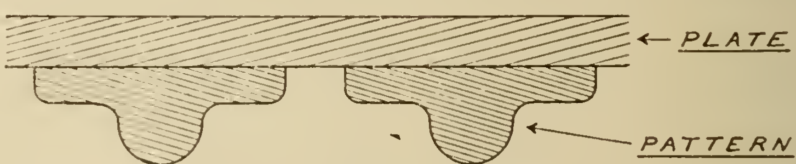


FIG. 2 "PLATE" PATTERN

Actual observation of the practical working of different methods of producing patterns has convinced the writer that no pattern which can be legitimately classed as being used for repetition work should ever be made except from a drawing which looks like the pattern, and gives the actual dimensions of the pattern itself. Mention is made of the fact that the drawing should look like the pattern, for the reason that, on small work, the allowances for shrinkage, finish and draft may make the appearance of the pattern quite different from that of the finished piece.

In making patterns for repetition work, micrometer calipers, vernier calipers, height gages, etc., are constantly called into requisition and as it would be both expensive and confusing to attempt to duplicate these in different shrinkage scales, it becomes necessary to work to figures which include the necessary allowances for shrinkage. To the man who is accustomed to big work on which a quarter of an inch is close, and a thirty-second is the very height of refinement, it may seem absurd to use thousandths in measuring patterns. But there are many cases in repetition work where this degree of accuracy is not only desirable but absolutely essential.

As an example of the effects of shrinkage and finish, let us assume that we wish to produce the piece shown in the upper part of Fig. 1, the marks f indicating finished surfaces.

The lower part of Fig. 1 shows the actual pattern dimensions assuming.

Shrinkage per inch of length, $S=0.01$ in.
Allowance for finish, $F=0.04$ in.

In this particular case, the various combinations of shrinkage and finish modify the final 4-inch dimensions so as to produce dimensions of 3.96 inches, 4.00 inches, 4.04 inches, 4.08 inches and 4.12 inches on the pattern.

In actual practice, the dimensions would not usually be strung out in one continuous line as in Fig. 1, but would probably double back on themselves to some extent. In addition, the shape of the casting might be such as to make the shrinkage irregular; it might be desirable to allow more finish at certain surfaces than at others, and it might be necessary to make additional allowances for draft.

In view of all the factors to be considered, the determination of the pattern dimensions by a process of mental arithmetic may be an excellent athletic exercise for the brain, but it is not a problem which a mechanic should be called upon to solve during working hours.

It is also necessary to remember that very few machinists or tool makers have much detailed knowledge of foundry practice, and that the trade of metal pattern making is still comparatively new. Patterns made and carded according to the best judgment of a tool maker have often been entirely rebuilt after the first attempt to run them in the foundry. Of course such occurrences indicate lack of co-operation, but the only practical way to secure effective co-operation is to prepare a drawing which records the decision reached after due consideration by all the interested parties.

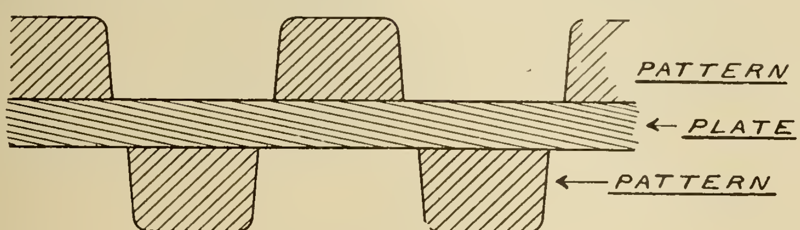


FIG. 4 "STAGGERED PLATE" PATTERN

There is no doubt but that the best and most economical results are obtained by using men who are skilled in working accurately to drawings and then supplying them with drawings which they can follow absolutely. Even if it were possible for the workman to carry in his head the various allowances required on a pattern, the lack of a record covering them would lead to endless trouble and confusion. If a pattern has to be duplicated or replaced, the worn one must either be copied as closely as possible, or the workman, who may or may not be the author of the original pattern, must introduce a new set of allowances. And while it sounds simple to tell a man to "make another just like this," we all know how the little errors accumulate until the final result is startling different from the original. It is said that a Chinaman can and will copy a model with absolute fidelity, but no one has ever had the hardihood to make a like assertion in regard to a workman of any other nationality.

For computing shrinkages, the drawing room should be furnished with a table giving the shrinkage per inch (in hundredths or thousandths of an inch) for each of the materials commonly used. This shrinkage, multiplied by the length in inches of any part of the casting, gives the allowance in inches direct. It may seem superfluous to explain this apparently self-evident procedure, but the author has seen cases in which the shrinkage was expressed in fractions of an inch per foot of length and in which each dimension was carefully translated into decimals of a foot before multiplying by the constant.

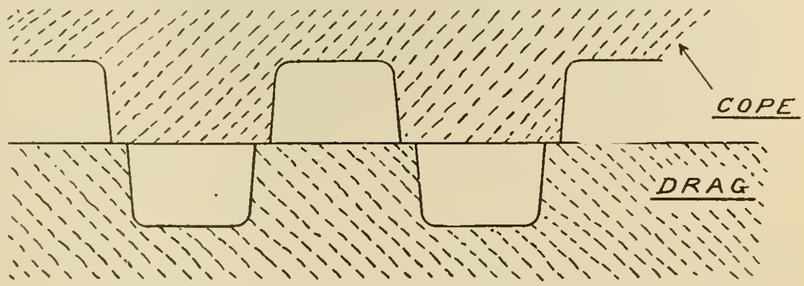


FIG. 3 CASTINGS STAGGERED IN DRAG AND COPE

It will frequently happen that there are certain parts of a casting where a high degree of accuracy is not necessary and a very little time spent by the drawing room in determining and indicating these points will be amply repaid by the saving in making the patterns. The required degree of accuracy can best be indicated by means of the number of decimal places in the figure giving the dimension. In using this method there must be an understanding between the drawing room and pattern maker that the permissible error is never greater than one in the last decimal place. For instance:

1.127 indicates a permissible error of 0.001 inch ±
1.120 indicates a permissible error of 0.001 inch ±
1.12 indicates a permissible error of 0.01 inch ±
1.10 indicates a permissible error of 0.01 inch ±

A carding drawing should be prepared in conjunction with the drawing of the pattern itself. These must be carried along together as a change in one will usually affect the other. The carding drawing should show clearly the arrangement of the runner, the enlarged portion of the runner where the sprue is to be cut, the location and size of the gates, the points at which they join the patterns, the arrangement of the patterns, the location and size of risers or shrink balls, is used, and the connections, if any, which may be needed in addition to the gates for supporting the patterns. It may really be looked upon as an assembly drawing, and will usually require only a few dimensions.

To avoid the confusion which might arise if carding drawings sometimes show the drag inside and sometimes the cope side, it is well to adopt the rule of showing all cardings as they would appear when looking at the drag side. In the case of an "open" carding, this rule causes the pattern to be shown as it appears when looking down on it as it lies on its mold board.

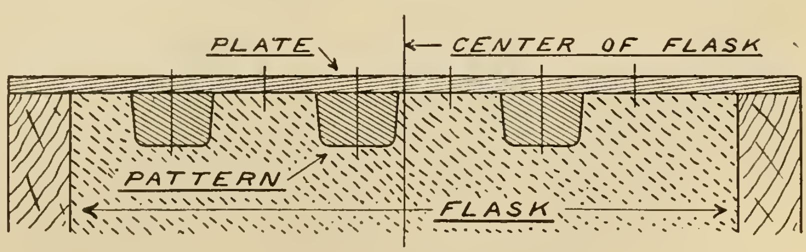


FIG. 5 "REVERSIBLE PLATE" PATTERN

Turning now from the general requirements, we may, for convenience, group under the following headings those details which involve a consideration of the peculiarities of each individual case:

A The number of patterns to be

grouped in one card and the size of the flask.

B The method of carding, whether mounted on a "plate" or as a "split" pattern, or "open" for use with a mold board, etc.

C Location of the parting line.

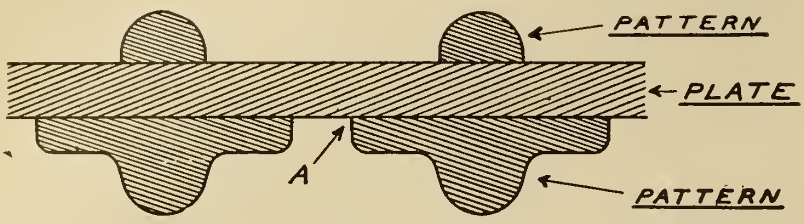


FIG. 6 "PLATE" PATTERN WITH PORTIONS OF PATTERN ON EACH SIDE OF PLATE

D Allowances for draft.

E Arrangement of the gates, runners, risers and supporting connections.

F Material of the pattern, and of the runner, plate, mold board, etc.

G The points on the pattern at which special accuracy is required.

H The amount of work to be expended on the pattern.

These in turn depend on the given conditions which may be tabulated as follows:

a The size and shape of the casting.

b The special requirements, if any, which may call for placing the pattern in a certain position or for providing risers, shrink balls, etc., in order to secure sound castings.

c The machining operations to be performed on the casting.

d The locating points for these operations.

e The points at which fillets and rounds are required.

f The degree of accuracy needed at unmachined portions and points, if any, where special accuracy is required.

g The rate at which the castings are to be produced.

h The probable total number required.

i The probable length of the intervals during which the pattern is out of use, and the conditions under which it is stored during these intervals.

Having determined the considerations affecting the design and construction, we may consider them in detail.

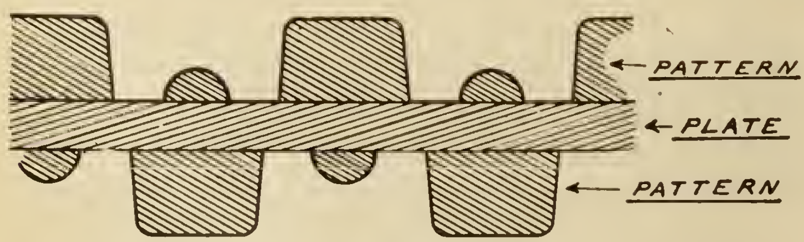


FIG. 8

"Staggered Plate" Pattern with Portions of Pattern on Each Side of Plate

For snap flask work it is usually necessary to allow a wall of sand about one inch thick outside of the extreme points of the patterns. If the card consists of a number of small patterns, the walls of sand between them tie into the outer wall and help to support it. Under these conditions no further support is necessary for castings extending, say, ½-inch or less above or below the parting line. If the castings are deeper, or if there is considerable length of outer wall which is not supported by other walls tying into it, a band may have to be provided, but the one-inch dimension may still be maintained. In most cases the work of handling the band is less than the work of handling the increased amount of sand required by a larger mold. Even if iron flasks are used, the one-inch dimension should generally be adhered to, as there is apt to be trouble in ramming, and danger of the flask acting as a chill if the outer wall of sand is reduced much below that figure.

Unfortunately the manufacturers of foundry supplies seem to have made no attempt whatever to select certain sizes of flasks which can be looked upon as standard, and therefore given the preference whenever circumstances permit. Their catalogues usually state that they will make any size of flask desired, but this does not help the man who is endeavoring to standardize his equipment.

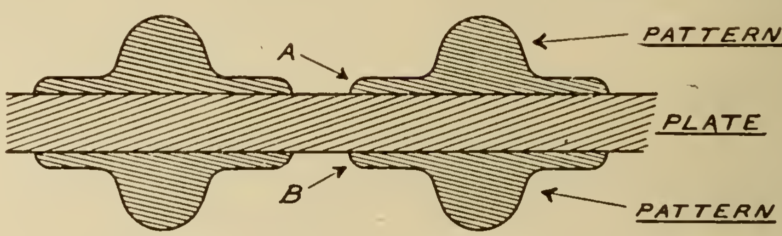


FIG. 7

Plate " Pattern Calling for Accurate Matching of Drag and Cope

Special sizes can never be entirely avoided, but the author recommends the general adoption of two sizes which have proved very convenient for small snap flask work. The smaller of these, 9 by 16 inches, inside measurement, is the best all round flask for work within its range. The larger one, 10 by 18 inches, inside measurement, is nearly as convenient, and there is no serious objection to its use, provided it permits of a more advantageous grouping for a given pattern. There is, however, a limit beyond which the increased weight of each mold more than offsets the advantage secured by the reduction in the number of molds. Experience shows that the output with a mold 9 by 16 inches is just about equal to the output with a mold 10 by 18 inches holding one-third more castings. Whether or not the larger flask will increase the capacity more or less than this amount can be determined only by laying out the possible groupings for each size.

Whenever there is a choice between any two sizes and their outputs are practically equal, the preference naturally rests with the smaller one as involving the smaller expense for patterns, flasks, etc.

In fixing the length and width of a flask, the designer has usually some latitude as he can vary the grouping of the patterns, but the depths of the drag and cope are less under his control. As the sand in the drag is never called upon to support its own weight, the depth of the drag need never be greater than is necessary to provide sufficient sand (say, 1½ inches after ramming or squeezing) below the deepest portion of the pattern. The depth of the cope must be sufficient to give a corresponding amount of sand above the pattern, and it must also be sufficient to make sure that the sand will support its own weight when the cope is lifted. The depth of the cope will sometimes be fixed by one and sometimes by the other of these requirements.

If the ramming is done by hand, the mold is struck off flush with the flask, and the depth of the latter corresponds with the desired depth of the mold. If the mold is squeezed by power, the flask must be deeper than the desired depth

of the mold by an amount equal to the squeeze. The squeeze may be figured as about four-tenths of the original average depth of loosely packed sand.

If the pattern is mounted in a frame,

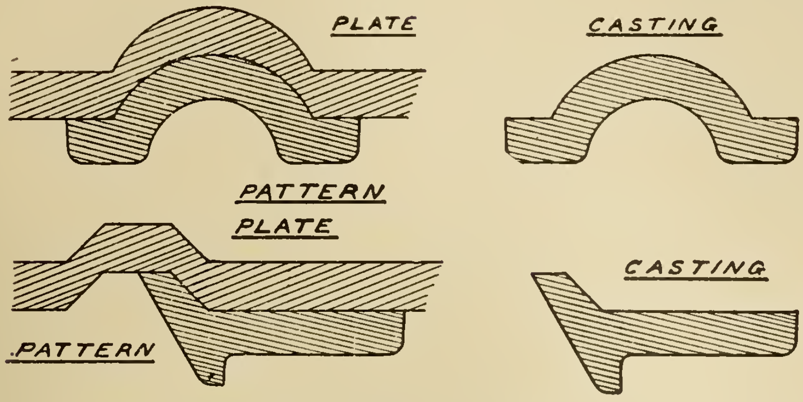


FIG. 9 "PLATE" PATTERNS IN WHICH THE PARTING SURFACES ARE NOT PLANE

the depth of the drag half of the flask must be further corrected by deducting an amount equal to the thickness of the frame. The frame should always be considered as belonging to the drag half of the flask.

The following table gives the minimum depth of flask which experience has shown to be permissible for a cope, squeezed by power, in order that the sand may support its own weight.

If the conditions require a deep flask, or one which is larger than either of the two sizes mentioned, care should be taken whenever possible to avoid molds beyond the capacity of a single operator.

For snap flask work the limits for a one-man mold are about as follows:

A Width 12 inches inside of flask. A greater width makes the mold liable to tip toward or from the operator.

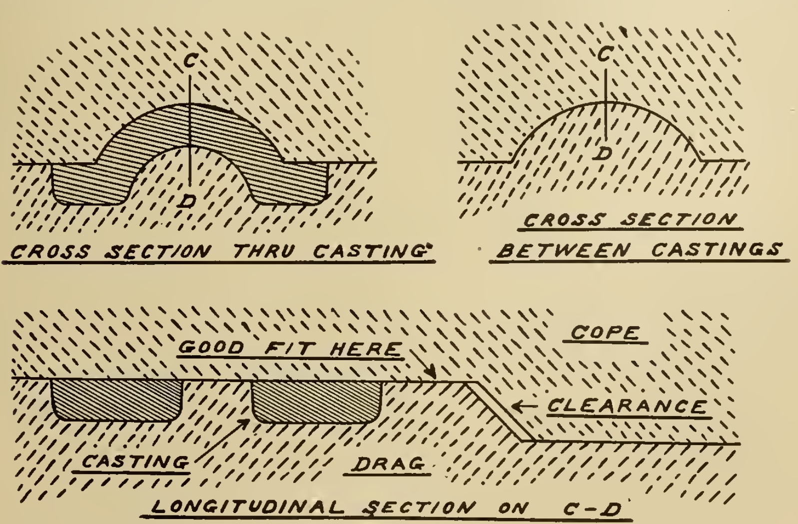


FIG. 10 CLEARANCE AT UNIMPORTANT PORTIONS OF PARTING SURFACE

B Length 24 inches inside of flask. A greater length requires an excessive spread of the arms.

C Weight 85 pounds corresponding roughly, for flasks of average depth, to an internal flask area of 250 square inches.

Care should be exercised to avoid molds which are square, or nearly square, as they are liable to tip, even if the width is less than the 12 inches specified above. The best shape is obtained when the width is from 5-10 to 6-10 of the length.

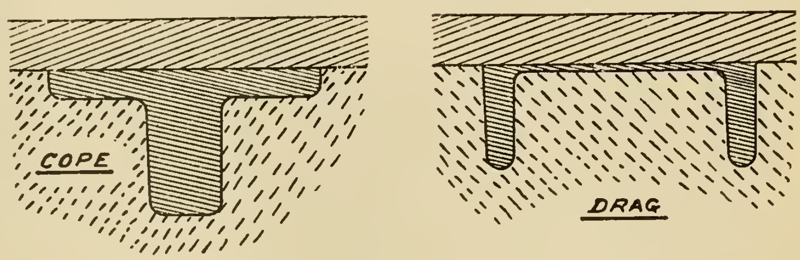


FIG. 11 "SPLIT" PATTERN

When carrying a mold supported by a solid flask the operator can rest it against his body, whereas a mold from which the flask has been removed must be swung free from all danger of contact. For this reason solid flasks may be somewhat larger than snap flasks in spite of the fact that the flask itself has to be handled in addition to the mold. The permissible increase may be taken at about 10 per cent. in length, 30 per cent. in width, and 50 per cent. in weight.

Although output is an important consideration, we must not lose sight of the fact that it is not the sole determining factor in selecting a flask size. If the required rate of production is low and the probable total requirements small, it may pay better to mount a few patterns on a small card in preference to carding even a considerably increased number for a slightly larger flask. Further reference to this will be made under heading "The Amount of Work to be Expended on the Pattern."

Every possible care should be exercised to limit the number of different sizes of flasks. A record should be kept of all existing sizes, and no new size should be created unless it is perfectly certain that none of the old ones are suitable.

The Method of Carding.

It will nearly always be a safe rule to use a plate whenever the pattern permits. It gives the most durable construction, and except in special cases, such as those shown in Fig. 5 and 11, it permits of making both halves of the mold at once. The simplest case arises when one side of the pattern is flat, permitting it to be mounted as shown in Fig. 2.

If, instead of being shallow, the pattern is deep, a considerable space must be left between adjoining patterns to give a sufficient wall of sand. In such a case a saving can be effected by putting the patterns alternately above and below the parting line as in Fig. 3. This can be arranged in two ways; by actually mounting patterns on both sides of the plate, as in Fig. 4, or by making only half the number of patterns and mounting them on one side as shown in Fig. 5.

It is evident that if the first half mold made is used as the drag and the next one turned over and placed on it as the cope, the desired staggering will be obtained. This style of plate is sometimes known as a "reversible plate," although, strictly speaking, it is the mold and not the plate that is reversible.

The first method gives the greater

output, as both halves of the mold may be made at once. It is to be preferred for shallow patterns of simple form, as it obviates the necessity for special accuracy in locating the patterns and keeping flask pins true. If the pat-

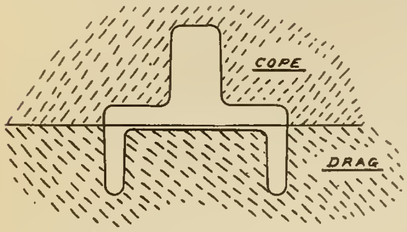


Fig. 12—Mold Made From "Split Pattern.

tern is complicated, a decided saving in pattern cost can be effected by using the second method. If the pattern involves a deep draw, the second method is again to be preferred, as it requires only the lifting of the pattern from the sand, and not the lifting of the cope off the pattern. The "reversible" method has the disadvantage which may in some cases prove serious, of producing half the castings under one set of gating and cooling conditions and half under another set. This is referred to in further detail.

Careful work to make the two sides of the plate match, and to keep the flask pins true is necessary if portions of the pattern have to be mounted on opposite sides of the plate. If a square corner is permissible at A, they may be mounted as in Fig. 6. If a round corner is required at both A and B they must be mounted as in Fig. 7. The staggered arrangement can also be used for patterns extending on both sides of the parting line as in Fig. 8.

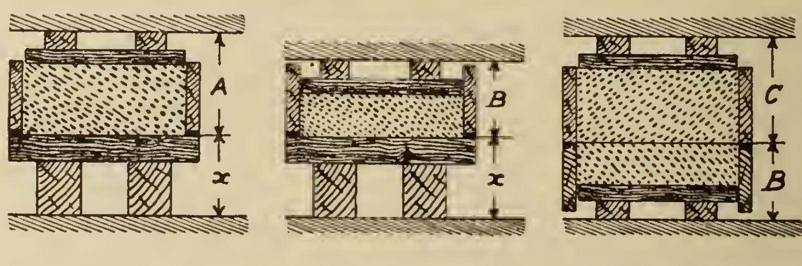
In order that the two halves of the mold may meet properly the vertical distance between the upper and lower faces of the plate must be constant throughout, excepting at certain points where an excess thickness is purposely provided, as referred to later. This condition can be easily met if the parting surface is a plane, but prohibits the use of a plate if this surface assumes a complicated shape. If the surface can be given simple geometrical form which can be easily machined, a plate can often be used to good advantage even if the parting is not in a single plane. Several cases of this kind are illustrated in Fig. 9.

In making such plates, the best results will be obtained if a little extra thickness is given to the plate at any points where an exact fit of the mold is not required. For example, in the first of the patterns shown in Fig. 9, the different sections through the molds should appear as shown in Fig. 10.

The "split" pattern is really a modification of the patterns shown in Fig. 6, 7 and 8, which is used if the draw is so deep that the cope can not well be lifted off of the pattern. In such a case the pattern is split, each half being separately mounted as in Fig. 11. The pattern is lifted from the drag and also from the cope, and the latter is turned over and set on the drag, making the completed mold appear as in Fig. 12. If used with a stripping plate the principle is the same, only the patterns are reversed and drawn downward through the plate, instead of being lifted up. If the casting happens to be symmetrical about the parting line, a single pattern can be used for both the drag and cope.

If the parting surface is too irregular for a plate the ordinary pattern connected to a runner and provided with additional supports, if necessary, must be used, so as to make an "open" carding. As this construction gives no backing to the pattern, a separate support must be provided in the form of a mold board. The use of the mold board makes it impossible to ram up both halves of the pattern at once. If power squeezers are used with this style of pattern, special care must be taken to give the drag a heavy squeeze and the cope a light one. If this precaution is not observed the pattern will be sprung and pressed still further into the drag half, when the cope is squeezed. When ramming by hand there is less danger of springing as the support afforded by the drag has to resist only the localized blow of the rammer instead of a pressure exerted simultaneously over the entire parting surface.

If the molds are squeezed by power, it is desirable to put cleats under the mold board so that the total height will be such as to keep the idle portion of the stroke as small as possible at all times.



Ready to squeeze drag After squeezing drag Ready to squeeze cope

FIG. 13 HEIGHT OF MOLD BOARD

From Fig. 13

$$A+x=B+C$$

it follows that

Desired height of mold board,

$$x=B+C-A$$
$$=C-(A-B)$$

where C is the combined height of cope and squeezing board before squeezing, and A—B is the amount of squeeze in the drag.

Locating the cleats so as to reduce the deflection of the mold board to a minimum is a matter which deserves attention, particularly in the case of long flasks. It may be assumed that the pressure exerted on the mold board through the sand is practically uniform at all points, and the mold board may therefore be treated as a girder, resting on two supports and uniformly loaded as shown in Fig. 14.

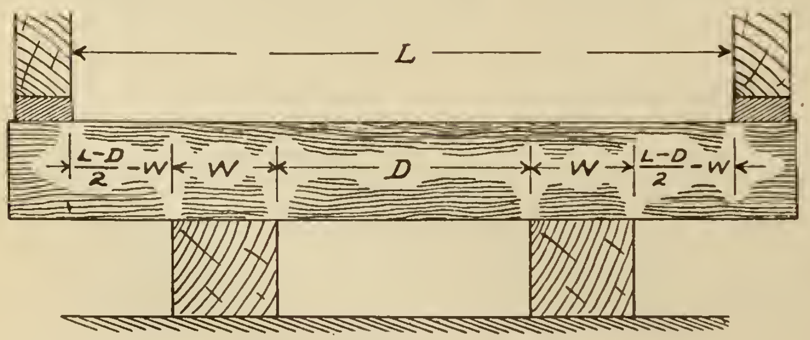


FIG. 14 SPACING OF CLEATS

For a pressure of P pounds per inch of length, the deflections may be represented as follows:

Deflection at ends of mold =

$$\frac{P\left(\frac{L-D}{2}-W\right)\left(\frac{L-D}{2}-W\right)^3}{S\qquad E\ I}$$

Deflection at centre of mold $\frac{P\ D\ D^3}{381\ E\ I}$

Placing these equal to each other, and solving we get

$$D=\frac{\sqrt[4]{3}}{\sqrt[4]{3}+1}(L-2W)$$

$$D=0.568\ (L-2W)$$

The cleats on the bottom boards and squeezing boards should be centred with the cleats on the mold boards. The thickness of the squeezing board and of the bottom board, including the cleats in both cases, must be greater than the distance traveled in squeezing. The middle view in Fig. 13 will make this clear.

(To be continued.)

Sherardizing, New Method of Galvanizing

Description of a Simple and Interesting Process with Many Advantages Over the Old Method.

The deposition of a coating of zinc on iron or other metals by means of the new process called "Sherardizing" is worthy of the attention of all those who are carrying on or contemplating galvanizing. This process is the invention of Sherard O. Cowper-Coles, of London, England, and has been in use in that country for some time with excellent results. It is, metallurgically speaking, one of the most interesting processes which have appeared in some time.

The process is a very simple one, and consists in heating the articles to be galvanized in a closed iron receptacle, such as a tumbling barrel, with zinc dust. At the same time the barrel is heated to about 600 degrees Fahrenheit. This temperature need not be exact, and from 500 to 600 degrees answer the purpose. The thickness of the coating depends upon the length of time that the articles are allowed to remain in the barrel. Any desired thickness may, therefore, be obtained.

The castings are cleaned in any desired manner, either by pickling, tumbling, or the sand blast. This part of the process is the same as it would be for ordinary galvanizing or electrogalvanizing. They are then placed in a closed iron drum or barrel, which is so made that it may be revolved and heated by a muffle furnace or other means. In the illustration the drum and the method of heating it are shown. The articles, after they have been treated, are shown issuing from the drum. When the articles are placed in the drum, a quantity of zinc dust is placed in with them. This zinc dust is a commercial article, and may be cheaply obtained.

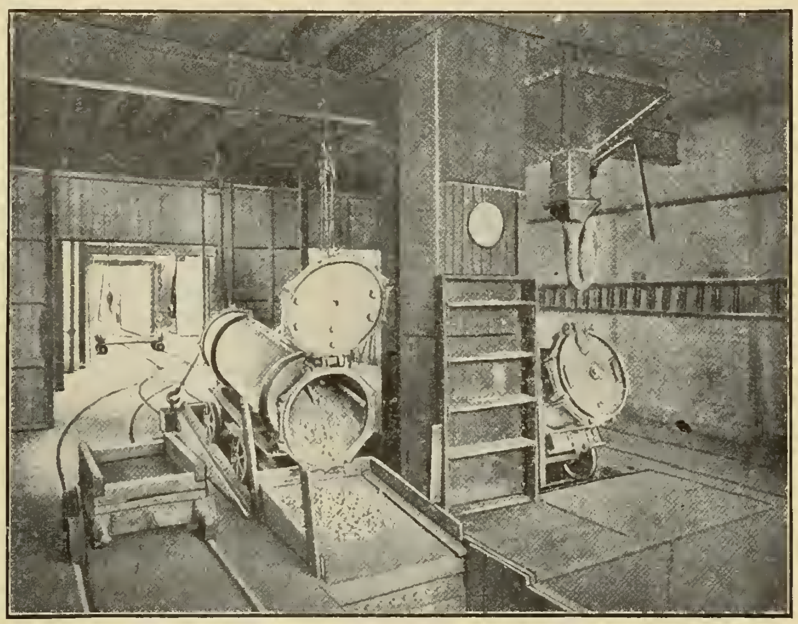
The process is based upon the fact that zinc volatilizes in an inert atmosphere at a temperature slightly below its melting point. The volatilized zinc, therefore, unites with the iron or steel (brass or copper may also be used) and forms an alloy with it. This allows it to adhere tenaciously. The zinc then continues to cover the surface until any desired thickness may be obtained. When finished, the articles are dumped out, sifted from the zinc dust, and are in a completed condition unless a highly polished surface is desired.

Material galvanized by this process has withstood five years of the most trying conditions. It has been found satisfactory to the British Admiralty, and also by the Colonial Government of the Gold Coast, where nothing but gunmetal or brass would withstand the severe conditions of the climate.

Tests which have been made of it by standard methods, or that known as the American telephone and telegraph test, resulted in a victory for articles that had been sherardized. Four dips in a sulphate of copper solution are required by this test, with a dry-wiping at each immersion. Many of the samples of material galvanized by the hot process broke down after these four immersions, but the sherardized samples stood ten immersions without injury.

There are many advantages of sherardizing which at once become apparent when the process is used. Some of them are as follows :

1. The zinc forms an actual alloy with the exposed metal and renders it far more difficult to corrode than ordinary galvanized articles. The coating has less tendency to peel on this account.
2. There is no zinc dross produced.
3. The plant may be started within a few minutes, and does not require the melting of a large mass of zinc, as in hot galvanizing.
4. No fumes are given off.
5. The thickness of the coating may be varied if desired.
6. An even coating of zinc may be contained on articles, no matter what their shape is. This is impossible when dip galvanizing is used.
7. Skilled labor is unnecessary.
8. Sherardized surfaces are harder than those which have been galvanized in the ordinary way.
9. The threads of screws or similar indented portions of articles are not filled up.
10. Sherardized articles may be soldered, painted, or otherwise treated.



Sherardizing Apparatus in use at Works of London Sherardizing Works, Willesden Junction, London, Eng.

Although sherardizing has been carried on in England and other countries, it has only recently been introduced into the United States. The United States Dry Galvanizing Company, of 34 Pine street, New York city, are the American agents for the process. A small plant is now being operated in New York city, and another is in process of construction in New Jersey. The illustration herewith shown was taken at the English works of the London Sherardizing Company, Willesden Junction, London.

John, the Laborer, Traces and Finds the Struggling Bar

An Interesting Machine Shop Yarn, Telling How John Traveled the Machine Shop and Foundry in Search of Struggling Bar.

BY ONLOOKER

Up shuffled Bill Sykes, the "devil apprentice," keeping the big machine between him and the foreman.

"Say, Pete, we got a new laborer."

"That so?"

"Yes, and he hasn't been anniciated."

Now Pete Johnson was mighty fond of a practical joke. He ran the big slotting machine near the centre of the shop. When having a "rise" out of some of the fellows he was happy. An uninterrupted morning's slotting gave him the "blues." He was a red-heaced, long-legged fellow, which perhaps accounted for his always being outside the shop before the sweet and melodious noon whistle ceased blowing. But it was a fact that Pete's overalls were always adorning the clothes post five minutes before quitting time.

Pete's grin suggested his appreciation of the situation. Then screwing up his features and scratching his head:

"What d'ye suppose we had better do?" he asked.

"There He is Over There," Said the Devil Apprentice.

"There he is over there," whispered the "devil apprentice," in a "stage whisper," as he pulled Pete around the radial drill. "Ain't he light-footed and airy?"

John, (no one ever knew his other name) the new laborer, went plodding down the shop, the sound of his big boots booming through the hiss of the air hoists and the crunching and squeaing of the drill close by.

"Vat der devil mischef are yer hatchin' now?" growled the drill operator, with his accustomed evil look.

"Shut up, old Sorehead," said Pete. "If you hadn't been so drunk last night you'd be more sober this morning." Sorehead shied a piece of board at Pete, which flew wide.

"Let's send him after the struggling bar," suggested the devil.

Pete grinned.

"That'll do," said he. "Now, you slide and put the others on."

Ten minutes later, Pete Johnson stopped the big slotter and took off his work.

"Hi, there, John!"

John was laboriously pushing a truck along the narrow gauge past the big slotter. He stopped.

"What?"

John had been noted in the Old Country for his lack of small talk.

"Come, help put this pulley on my machine."

Grunting, John turned his truck off the track.

"You go for the struggling bar while I change this tool," Pete requested politely, without looking John's way.

John was new to the machine shop and the fact that he hadn't heard of a "struggling bar" didn't surprise him. He looked at Pete's back for a minute, then sidled up to an apprentice.

"'E told me to bring the struggling bar."

The apprentice's mouth twitched, but keeping a straight face, he pointed out a big, brawny man.

"That fellow was using it a little while ago."

John did not look back, and so missed the chorus of grins from the district around the big slotter.

"'Ave you the struggling bar?" asked John.

The big brawny man was Dougal MacDonald, who ran the big engine lathe. He looked up with a quizzing glance.

"You be a new mon?"

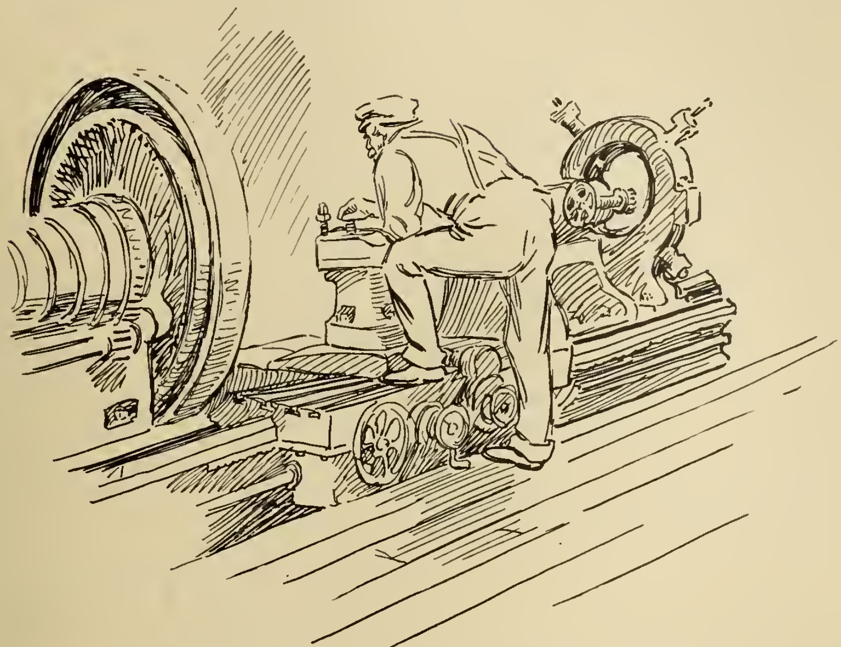
John nodded, and Dougal turned away with a broad grin.

"Oh, aye, the struggling bar," said he. "I ken Jones wand be using it the noo," he murmured, thinking hard, and he pointed out Jones at the far end of the shop, operating a drill.

Away plodded John, industrious, but thick headed.

By this time he was the centre of interest, but all unconscious he reached Jones.

Jones was mad. He hadn't seen the struggling bar. Yes, he had too, and Pete Johnson opened his eyes wide when John, with his truck and struggling bar, appeared through the door of the machine shop. The joke was improving. There was a howl from the apprentices, and grins became general. But suddenly silence reigned supreme, and each man and boy worked with unusual absorption. Pete wore a concentrated and hard worked expression as he worked his hand feed, and stretched his neck to watch his tool take the finishing cuts. For they all knew the superintendent.



Dougal MacDonald, Who Ran the Big Engine Lathe.

He stalked down the shop in busy conversation with a jovial chap, who looked like a machinery salesman.

But under the boss's shaggy brows gleamed a pair of penetrating eyes. Out of the corner of his eye Pete saw a catastrophe brewing. John arrived at the big slotter and was laboriously arranging his air hoist for easy unloading, and he jumped at the sharp, "What's that you have there ?" as the superintendent stopped opposite the truck.

"The struggling bar," said the scared voice of John.

Every person held the superintendent in awe, and this being John's first encounter he was not to be blamed.

"The what ?" exclaimed the superintendent. Then he knew, and his glance fastened itself on Pete's lanky back. John, too, began to smell a rat, and as he pushed his truck and "struggling bar" back to the blacksmith shop, he boiled all over, but as usual mostly to himself. Squinty doubled up with appreciation of his own joke, and John's "Darn you" sent him into semi-convulsions.

John continued his search towards Harry Kinghorn.

"The struggling bar ? Yes," said Harry. Squinty took it out to the blacksmith shop half an hour ago. Follow the track out that far door and across the yard and you will find the blacksmith shop. Ask for Squinty Hope and he will tell you where it is."

"Darn !" said John, as he trudged down the machine shop.

From the door of the blacksmith shop John could see nothing but smoke, lit up here and there by a dull glow, for down draft was not used in that shop, and there was very little up draft either.

"Darn!" again hissed John to himself.

He hesitated, but then digging his heels into the soft earth of the floor, with many muttered ejaculations, he made his way towards three dim forms he saw through the smoke, one of which proved to be Squinty.

Now Squinty had a few ideas of his own. In his own way he was quite a genius. Squinty had an inspiration. Back to the machine shop went John for his truck, and in the smoke of the blacksmith shop Squinty obligingly helped John load up the axle of a pair of locomotive drivers, which had been lying around for years.

John struggled with the struggling bar and the appropriateness of the name came home to him.

What's That You Have There ?

In the machine shop things were more serious.

"Say Pete, you'll have to cut this out. The old man's good an' mad this time. Somehow he got wind of that waste battle between the kids last week, and he hauled me over the coals to a lively tune. And you'll be drawing your discharge ticket some of these cold mornings." So spoke the foreman.

Pete grunted but said nothing.

As soon as the foreman was well up the shop, the devil apprentice started his finishing cut on the car truck axle and dodged around the machines up to the big slotter.

"Who's der choke on now?" grunted Sorehead, from under the radial arm.

"Stow it," suggested Pete, "you couldn't appreciate a joke if it were rammed down your throat with a ramrod." The devil giggled appreciatively.

"Say, Pete, are you sure there ain't a couple of holes in your back? The boss looked as if he would eat you. Say, but wasn't it a joke," and the two staggered around holding their sides. It was some time before Pete turned to his machine.

(To be continued.)

An Improvement in Air Brake System

An important invention relating to the angle cock for air brake system as used on railway trains.

An invention improving the present form of air brakes has been taken out at Ottawa by Fetherstonehough & Co., Montreal. The object is to improve the present form of angle cock by providing means to automatically throw the air brake into operation if the cock should be tampered with or moved from its open position in train line service. It consists essentially of a three-way valve having one side connected to a whistle, the other two sides of the cock being placed in communication with the opposite sides of the angle cock. By means of the attachment to the lever shown in Fig. 3, for operating the three-way valve, both sides of the angle cock are opened to the atmosphere thus operating both the whistle and the air brakes.

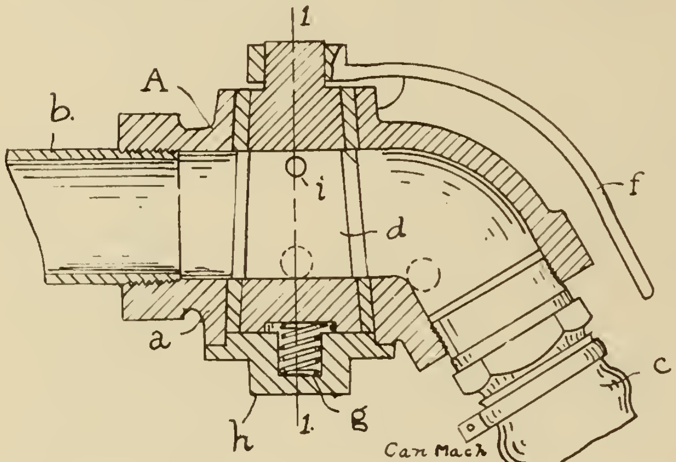


Fig. 1—Vertical Longitudinal Section of the Angle Cock.

Referring to the drawings A is the angle cock, consisting of a casing "a" connected at opposite ends of the train line pipes "b" and the connecting hose "c" and having operating therein the conical plug "d" which has a passageway "e" to permit the passage of air through the casing. An operating handle "f" is secured to the top of the plug which is secured in position by a com-

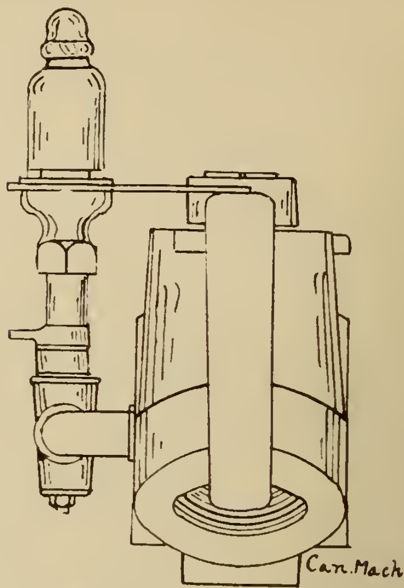


Fig. 2—End View of Angle Cock.

pression spring "g" and a nut "h" screwed in the bottom of the casing.

A port "i" affords communication between the train line and the passageway. The passageway when rotated connects with the three-way valve B and this valve is connected to opposite side of train line pipe to that which port "i" communicates. The other side of the three-way valve connects with the whistle.

The automatic operation of the three-way valve B is provided for by a link "o" which connects the operative lever "p" of the three-way valve with the

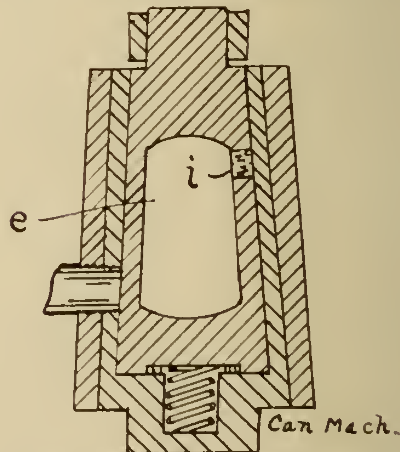


Fig. 4—Section on Line 11, Fig. 1.

operating lever "f" of the angle cock, thus causing any rotation of same to operate the three-way valve.

The new device which is patented in Canada, United States and Great Britain, has been tested thoroughly and is in favor with railway men. The inventor is William Bernard, of Smith's Falls.

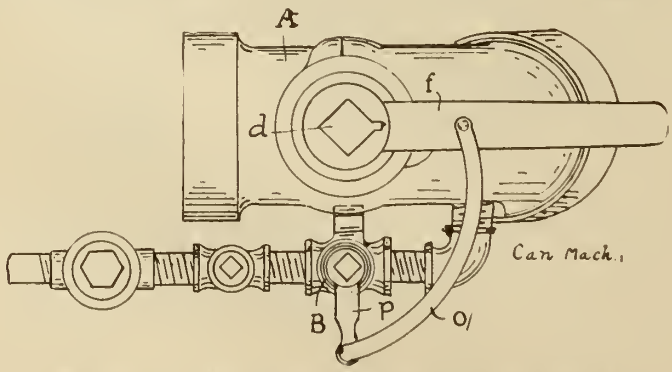


Fig. 3 Top View of Angle Cock and Connection.

NEWS OF THE SOCIETIES

MECHANICAL ENGINEERS' CONVENTION.

The twenty-eighth annual meeting of the American Society of Mechanical Engineers was held at 29 West Thirty-ninth street, New York City. It opened on December 3rd and continued during the week. At the first session the retiring president, Frederick R. Hutton, spoke of the mechanical engineer and the function of an engineering society setting forth the advantages of a society. The election of officers followed, when M. L. Holman, St. Louis, Mo., was elected president; Prof. L. P. Breckenridge, University of Illinois, and Arthur West, Pittsburg, vice-presidents, and W. H. Wiley, New York, treasurer.

At the Wednesday morning session, F. E. Junge, Berlin, Germany, read a paper, "The Rational Utilization of Low-grade Fuels in Gas Producers." This paper treated of the economic importance of utilizing lignite and low-grade fuels, giving special consideration to the employment of gas producers. He referred specially to the development of the methods employed in Germany in industrial pursuits.

Mr. W. B. Russell, New York, read a paper on "The Apprentice System of the New York Central Lines." An illustrated lecture on "Color-photography" was given Wednesday evening by F. E. Ives.

On Thursday papers were presented on a "Duty Test on Gas Power Plant," by Mr. Bibbons, and "Control of Internal Combustion in Gas Engines," presented by Professor Lucke. These papers were intended to throw some light on the efficiency of a producer gas plant and the improvements in design in the gas engine.

At a separate meeting of the foundry section, several phases of foundry practice were covered, papers being read on "The Foundry Department and the Department of Engineering Design," by W. A. Bole; "Molding Sand," by A. E. Outerbridge, jr.; "Power Service in the Foundry," by A. D. Williams, jr.; "New Foundry for Bench Work," by W. J. Keep and Emmett Dwyer; "A Volumetric Study of Cast Iron," by H. M. Lane; "Specifications for Iron, Coke and Methods of Testing Output," by R. Moldenke; "Foundry Cupola and Iron Mixture," by W. J. Keep; "Foundry Blower Practice," by Walter B. Snow; "Patterns for Repetition Work," by E. H. Berry, and "Some Limitations of Molding Machines," by E. H. Mumford.

Some other interesting papers were also read at future sessions. These included, "The Evolution of the Internal Combustion Engine," by S. A. Reeve; "Engine Design for Superheated Steam," by Mr. Toltz; "Power Transmission by Friction Driving," by Professor Goss, and "Cylinder Port Velocities," by J. H. Wallace.

All these papers are printed in book form by the American Society of Mechanical Engineers, 29 West Thirty-ninth street, New York, where any of them may be obtained at small cost.

The registration at this meeting of the association was the largest in its history, 727 members having registered, and 605 guests, making the total registration 1,332.

MANITOBA ENGINEERS.

A Manitoba branch of the Canadian Society of Civil Engineers has been formed with Col. H. N. Ruttan, Winnipeg city engineer, as chairman. Prof. Brydon-Jack, of the engineering department of Manitoba University, was elected secretary.

* * *

At the Engineers' Club on Thursday, December 5th, Mr. D. A. Bradley gave an interesting paper on Gas Engines, reviewing the growth of gas producer plants and the gas engine. He pointed out that a great saving could be effected by utilizing the gas from blast furnaces for gas engine power.

C. A. S. E. MEETING.

The Canadian Association of Stationary Engineers at a meeting in London, Ont., discussed, among other things, the act passed by the Ontario Legislature at last session, respecting stationary engineers, requiring that after July 8, 1908, certificates of qualification must be held by men in charge of steam plants. The prevailing opinion seems to be that the act does not completely cover the ground and the hope was expressed that the government will see its way to further strengthen it.

The next monthly meeting of the American Society of Mechanical Engineers will be held Tuesday evening, January 14, in Assembly Room No. 1, of the Engineering Societies' Building, at 29 West 39th Street, New York.

The subject will be "Car Lighting," the presentation being made by R. N. Dixon, president of the Safety Car Heating and Lighting Company, and will treat of the general subject of light of trains, showing relative economies in the several systems, electric and gas.

PERSONAL MENTION.

Charles Fawcett, founder of the Sackville Stove Foundry, died at Sackville on Nov. 27.

* * *

Mr. A. H. Sisson, of the St. Louis Car Works, will be general manager of the Fort William Car Co., and R. W. Morrison, also of the St. Louis Car Works, will be head of the sales department.

* * *

Mr. R. F. Tate, Toronto, resident engineer of the Mackenzie & Mann Co., died suddenly at Toronto, Nov. 28. He has been with Mackenzie & Mann for ten years and was formerly chief engineer on the Midland Railway.

* * *

Messrs. Hawken & Palmer have opened up offices at 84 Victoria St., Toronto, as consulting mechanical engineers, making a specialty of steam plants.

* * *

Messrs. Connor, Clarke & Monds, consulting engineers, have dissolved partnership. Mr. Connor, structural engineer, will continue the cement testing laboratory, while Messrs. Clarke and Monds will enter the contractors' field.

* * *

Four new factory inspectors have been appointed for Western Ontario. The new inspectors are Robt. Hungerford, Shaw St., Toronto; S. J. Mallion, Stratford; Henry Clark, 434 Ottaway St., London; and Fred Kellond, 157 Wellington St., Hamilton.

* * *

Mr. Emil Hallman leaves on Jan. 6th for Vancouver to open up and take charge of the western office and warehouse of H. W. Petrie, Limited. This enterprising house is extending their business and find it necessary to open up a western office and warehouse to better look after their growing trade.

* * *

Mr. S. Mitsu, an electrical engineer from Tokio, a graduate of the Imperial University of Japan, is traveling over the world, visiting the great electrical developments in the different countries. He devoted special attention to water powers while in Canada during the past month, and looked over several of Canada's large power developments.

* * *

Lord Kelvin, the great scientist and inventor, died in Glasgow on December 17, after a fortnight's illness. He invented many telegraph appliances, steamer speed measuring mechanisms, and was electrical engineer for the French Atlantic cable in 1869, the Brazilian and River Plate cable in 1873, the West Indian cables in 1875, and the Mackay-Bennett Atlantic cables in 1879.

Mr. L. O. Armstrong has been appointed manager of the industrial department of the C.P.R. at Montreal.

CANADIAN MACHINERY

and Manufacturing News

A monthly newspaper devoted to machinery and manufacturing interests, mechanical and electrical trades, the foundry, technical progress, construction and improvement, and to all users of power developed from steam, gas, electricity, compressed air and water in Canada.

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Canada, United States, $1.00, Great Britain, Australia and other colonies 4s. 6d., per year; other countries, $1.50. Advertising rates on request.

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Vol. IV. JANUARY, 1908 No. 1.

CONTENTS

THE OUTLOOK FOR 1908 IS OPTIMISTIC.

Throughout the United States there is a financial stringency. There has been curtailment in all directions of industrial enterprise with a resultant discharge of labor. Hard times are very near to the people of the United States. Why is this? Is it because there has been a general crop failure? Not so! Crops have been quite as good as usual, and a few months ago manufactories were crowded with work.

This financial stringency is the result of an immense scare. The wealth of the country is made up of several sections, of which money is one. It is with this section that trading is done in the other sections. Should an occasion arise when all people wish to convert their wealth into the money section, then there will be a scarcity of money. Such is the case at present. The lime light was turned somewhat abruptly upon Wall St., and the so-called "business transactions" carried on there were shown up in their real colors. As a result, there was a run upon the banks and trust companies which loaned money to brokers and manipulators in Wall St. Because of these revelations the people lost confidence in the leaders of finance and industry. Stocks and securities were thrown on the market, and there was a terrible shrinkage in values. Gradually confidence is being restored, and in time things will be readjusted. But the time required for rebuilding will be greater than that taken in the demoralizing.

Thus a country in a time of great prosperity, in a year of splendid crops and underproduction, can be plunged into a period of hard times. Surely it is time that this "parasite," masked as "business," feeding upon the life and stability of the land, should be stamped out! Surely it is time that the millions used annually in Wall Street in useless speculation should be directed into channels where it will help to build up and develop the country! Surely the condition existing in Wall Street and other like places throughout Canada and the United States, when a certain number of persons are interested in the depression in value of stocks and securities is a menace to the community!

Ten years ago Canada would have been greatly influenced by such a condition existing in the United States; but all Canadians cannot but be proud of the fact that Canada has shown herself to be a country free to a very great extent from outside influences. To be sure stocks and securities went down as in the United States, and there was a tendency at first to rush for the currency of the realm; and many men with money are keeping a tight grip on it. But the industrial world has not been affected to any extent, except in a few odd instances, where small industries with no capital have gone to the wall. But

HAPPY NEW YEAR.

Last year we wished all our subscribers and advertisers a happy and prosperous New Year. Many of them were kind enough to wish us the same. We know that the wishes of our friends were amply fulfilled, as the past year has been a happy and prosperous one for us. We trust our wishes for our friends have met a similar fulfillment.

This year we again wish all our readers happiness and abounding prosperity for 1908.

the banks are to be praised for the way they have handled the situation. While they have cut off many loans which were intended for land or stock speculation, they have continued to advance money for legitimate industrial enterprises. As an object lesson of the soundness of Canadian banks not long ago, the Michigan Central Railway, for the first time in its history, paid all its employes in Ontario, in New York, Indiana and Illinois, in Canadian money, totaling $300,000. Another instance: a business firm in San Francisco refused a check from a Canadian firm for $5,000 on the First National Bank of New York, but accepted one for the same amount on the San Francisco branch of the Canadian Bank of Commerce.

The daily papers have made much of the situation by publishing all kinds of reports of retrenchments, many of which they have contradicted in the next issue; and practically all the authentic ones have been the usual fall curtailment of expenses.

Canada has entered upon a period of great development and prosperity, and nothing should disturb the steady, onward progress but general crop failure or great over-production, and these should be only temporary lapses. This year there have been splendid crops in Canada; it has been a year of splendid industrial expansion; the estimates furnished recently by the Finance Minister reflect the broad and general prosperity of the Dominion; the last report of the Department of Trade and Comerce shows satisfactory increase in trade during the year. What more can a country look for? Is there any reason for hard times? Is there any room for pessimism? Surely not! A country with a wheat belt like Canada's, with mineral and forest resources such as she has, can, with the greatest of security, look forward to the coming year with the brightest of hopes. At the present time there are a great number of unemployed in the large cities, but this is due solely to steamship companies landing English and foreign emigrants in Canada with great promises, none of which have been fulfilled.

We have received many answers in reply to some letters sent out to manufacturers and business men in Canada, and the tone of all is that of optimism. Some few say that they are feeling the financial stringency at the present time; but practically all are looking forward to very busy times during the coming year.

WHY SO MANY RAILROAD WRECKS?

The number of railroad wrecks with their appalling loss of life and large loss of rolling stock has shown clearly that something must be done at once to obviate this serious situation. During the year ending March 31st, 1907, there were 460 persons killed and 603 injured, compared with 381 killed and 223 injured on the railroad in the year previous. During November, we had reports almost every day of serious accidents on several railroads, and there is some work ahead of the Railway Commission in locating and removing the causes. The first cause suggests itself from the broken rails—is the design or composition correct? Are the rails heavy enough for the weight they must carry? Is the strengthening web weak? All these questions must be answered if this cause is to be eliminated.

Another cause is suggested by the number of rear-end collisions. Conductors are not altogether to blame for these accidents. This is another question for the Railway Commission, and we suggest its solution in the block system, not three trains on a block, but one train, one block. What the public requires at present is a policy that will change the chapter of accidents that we have read within the past few months. The percentage of risk is largely increasing, and it is time for the Railway Commission to take this matter into their hands.

Where there are double tracks the block system is more easily introduced, but can be on the single track line as well at small expense. There would be a saving in railroad property alone of thousands, yes, millions of dollars, and we believe the block system can be economically installed. It will certainly reduce the cost of collisions. Automatic block systems have been installed on some of the American lines and these should be investigated. Increase the numbers of the Railway Commission again, if necessary to efficiently accomplish their work, widen their scope for work and increase their power.

Faults of railway apparatus have occurred and flagmen could still be retained to work in conjunction with the automatic signals. The Railway Commission has noticed the deficiencies in the air brakes, and it is rather serious if thirty per cent. of the brakes now in use are defective. Other apparatus must be diligently investigated and manufacturers of signals should be co-operated with to obtain perfection. Severe measures cannot be adopted too soon to overcome in some measure, at least, the serious loss of life and property on the railroads of Canada.

MAKE COLLECTIONS NOW.

To those who have not yet made a special effort to get their business on a good cash basis we would impress the necessity of doing so at once. Money is fairly plentiful around Christmas time, and a persistent well-planned collection campaign should bring very satisfactory results at this time of the year.

The giving of long credits has been the weak point in many industries and any concerns that appear to be suffering at all in Canada belong to this class of business. Now is the time to advantageously get a business on a cash basis. More attention should be given to the details of business. The little leaks should be hunted up and stopped, better system should be introduced into the several departments, great care should be exercised in buying and exact cost systems should be applied with a view to finding the returns from the different departments. Future actions should depend on cost reports. Business may be stimulated by the use of good trade papers, which should be studied for hints that may lead to reduction in expenses and expansion of business.

Canada has an enviable position to-day with her great resources and with the present period of industrial growth. The conditions which are being materially felt elsewhere cannot be serious or long continued here. It remains for us, however, to take advantage of this by being careful to avoid any contingency and to build up business with all possible activity.

INDUSTRIAL PROGRESS

CANADIAN MACHINERY AND MANUFACTURING NEWS will be pleased to receive from any authoritative source industrial news of any sort, the formation or incorporation of companies, establishment or enlargement of mills, factories or foundries, railway or mining news, etc. All such correspondence will be treated as confidential when desired.

New Plants and Additions.

The Vancouver Gas Co., Vancouver, B.C., will extend their plant.

J. S. Crawford, Ottawa, will erect a foundry at Haileybury, Ont.

Two new asbestos mills are being constructed at Broughton, Que.

The Minister Myles Shoe Company, Toronto, will erect a factory to cost $30,000.

The Otis Fensom Elevator Co., Toronto, Ont., will erect a factory in Vancouver, B.C.

The new shingle mill of the Brunette Saw Mills Company, B.C., has been completed.

The King Electrical Works, Ltd., Montreal, E. W. Sayer, president, has been registered.

The Canadian Bronze Powder Works have completed a fine factory in Valleyfield, Que.

The Don Paper Mills Co. will build an extension to their Toronto factory to cost $10,000.

The Lamb-Watson Lumber Co., Arrowhead, B.C., are increasing their electric lighting equipment.

The Canada Tin Plate and Sheet Steel Co., of Morrisburg, Ont., have formally opened their plant.

The Dominion Wrought Iron Wheel Works, Orillia, Ont., are making additions to their factory.

The Canadian Glass Mfg. Co., Montreal, have completed rebuilding their plant at a cost of $50,000.

The capital of the Brandon Electric Light Company has been increased from $125,000 to $100,000.

The Ontario Power Co. recently installed the fifth generator in the power house at Niagara Falls, Ont.

A planing mill and sash and door factory will be erected by Harbour & Carter, at Saskatoon, Sask.

The Sutherland Innis Co., Chatham, Ont., are trying to secure a free factory site at Rainy River, Ont.

The plant of the Canadian Asphalt Paving Company, Ottawa, was damaged by fire to the extent of $1,500.

Fire did damage to the plant of the Beck Box Manufacturing Company, Toronto, to the extent of $5,000.

The Superior Portland Cement Co. has commenced the manufacture of Portland cement at Orangeville, Ont.

Plans are being prepared for a bridge to be erected over the Matapedia river, N.B., at a cost of $45,000.

The Union Foundry and Machine Co., St. John, N.B., are making extensive improvements to their plant.

Thomas O. Curtiss and John B. Marcon have registered as proprietors of the American Machinery Co., Montreal.

The Canadian Portland Cement Co. are erecting a large plant for the manufacture of cement at Welland, Ont.

The Grand Valley Radial Co. has applied to the Hydro-Electric Commission for between 2,000 and 3,000 horse-power.

Damage was done by fire to the machine shop of the Smart-Turner Machine Co., Hamilton, Ont., to the extent of $5,000.

The Cobalt Contact Company, Cobalt, Ont., will install a gas producer power plant with six drill compressor next season.

Robt. J. Clements, of Chatham, Ont., has leased the Tilbury Iron Works, formerly conducted by C. Wylie, Tilbury, Ont.

The Central Electric Light Company, Portage la Prairie, Man., are preparing to extend their power plant at a cost of $35,000.

An American match firm are negotiating with Prince Albert, Sask., for the location of a $300,000 factory in that vicinity.

The Fleming Aerial Ladder Company has submitted a proposition to Barrie, Ont., for the erection of a plant to cost $26,000.

The American Furnace Co., Niagara Falls, Ont., is having a plant erected for the manufacture of fine steel by electricity.

An American firm has submitted a proposition to the council of Prince Albert, Sask., to erect a $100,000 match factory there.

The Nanaimo, B.C., Electric Light, Power & Heat Company, will increase the capacity of their plant by building a large dam.

It is expected that a large pulp and paper mill will be erected at Howe Sound, B.C., A plant to cost $1,000,000 will be erected.

The Cement Brick Co., which was organized some time ago to operate at Sydney, N.S., will open a branch plant at Glace Bay, N.S.

The factory of the Tombyll Upholstering and Frame Manufacturing Co., Montreal, was destroyed by fire, entailing a loss of $60,000.

Fire did damage to the factory of the Abbott Manufacturing Co., Toronto, to the extent of $..,000. The factory was completely destroyed.

At the annual meeting of the Robertson Machinery Company, Welland, Ont., H. D. Hooker was elected president and G. Wells, secretary.

The factory and dry kiln of the Rat Portage Sash and Door Company, Winnipeg, Man., was destroyed by fire, the loss amounting to $150,000.

All preparations have been made for putting in a steel plant at the Royal Collieries' property, Lethbridge, Alta.; estimated cost, $50,000.

The Scott Machine Co., London, Ont., has received an order from the Department of Public Works for two L. and K. test boring machines.

A large storehouse has been erected by the Standard Wire Fence Co., Woodstock, Ont., Another loom has also been added, which largely increases the output.

It is reported that the Canadian Northern Coal and Ore Dock Company will shortly proceed to double the capacity of their plant at Port Arthur, Ont.

The International Automatic Lifeboat Company has been organized at Rexton, N.B., and will manufacture lifeboats. The capital of the company is $350,000.

The Ottawa electric commission and the Ottawa Electric Co., Ottawa, have agreed upon $29,000 as the price of the plant which will be taken over by the city.

The Wallaceburg Flax & Cordage Co., Wallaceburg, Ont., are installing new machinery of much greater capacity than hitherto, with a view to largely increasing their output.

On January 6 the ratepayers of Listowel, Ont., will vote on a by-law to grant G. Melrose freedom of taxation and other privileges for the erection of a foundry in that place.

The Dominion Iron and Steel Co., Sydney, N.S., has leased the property of the New Brunswick Iron Co., at Lepreaux, N.B., and will commence operations on a large scale.

A site of 67,800 square feet of land has been purchased on McGill street, Montreal, for the erection of $3,000,000 custom house, which will be one of the most handsome Government buildings in Canada.

The Brown-Boggs Co., Limited, of Hamilton, Ont., have decided to put in a gas engine and producer gas plant to supply power for their entire work and are now in the market for an outfit of this kind.

Ald. W. H. Westman, of the Chatham Malleable Iron & Steel Co., Chatham, Ont., states that it is the intention of the company to build a new factory shortly, provided a suitable site can be secured.

Two electric pumps will be necessary for the installation of a water system of Dominion, N.S., specifications of which are being prepared. The estimated cost is $26,000.

The Collier Cunningham Company, Peterboro, have purchased machinery for the equipment of their new factory, where they will manufacture electric irons and all kinds of electrical heating apparatus.

The Canadian Fairbanks Co., Toronto, have submitted an offer to the town of Shelburne, N.S., for a producer gas plant, engine and electric generator of 200 h.p. capacity, for ... Altogether $30,000 will be expended.

Secretary L. Nelles, of the Board of Trade, London, Ont., is in communication with Messrs. Armstrong and Mantien, of Springfield, Conn., who are negotiating for the location of a match factory in that place.

The Steger Canadian Sand-Lime Brick Company are arranging for the installation of their plant at Vancouver, B.C. Machinery is being installed and the firm will be ready to ... orders for those intending to build next spring.

The Dominion Steel Co., Montreal, has recently closed a deal for thirty square miles of coal fields, including the Cow Bay fields of the Cumberland Railway and Coal Company, N.S. The company will mine their own coal in future.

The Warner-Gibson Company, Limited, manufacturers of agricultural implements and holders of patents on a manure spreader that is said to be a good one, is fitting up a plant in Welland to carry on the manufacture of this line.

The Ottawa Corporation has placed an order with Mesrrs. Glenfield and Kennedy, Kilmarnock, Scotland, for two sets of duplex pumps, each 19¼-in. diameter by 26-in. stroke. Each pump will deliver 4,000,000 gallons in twenty-four hours.

Certain American capitalists have been so impressed with the possibilities of the district between the Muskoka Lakes and Sudbury, Ont., that they are going to invest several million dollars in mineral development and in the erection of pulp mills.

Duke and Dumont's tender for the new I.C.R. shops at River Du Loup, Que., has been accepted. This contract is for the erection of two large steel framed buildings for the construction of locomotives and general repairs. The amount specified is $89,874.

Wm. F. Tait, Geo. F. Atkinson and C. Lionel Hannington, of Dorchester, N.B.; G. A. Irving, Rexton, and Wm. Nowlan, of Kent county, N. B., have organized the "Dorchester Woodworking Co.," to carry on a general woodworking manufacturing, lumbering and milling business.

Work will be commenced immediately on the erection of 2,000 miles of wire fence between Winnipeg and Edmonton, Alta., along both sides of the right of way of the Grand Trunk Pacific Railway. The Canadian Steel & Wire Co., Hamilton, Ont., have been awarded the contract.

The Metropolitan Electrical Company, of Ottawa, has offered to sell their power plant at Britannia for $200,000. The company also offers to put up a guarantee of $100,000 that from its completed plant power can be delivered at the Ottawa sub-station at less than $10 per horse-power.

The Red Cliff Lumber Company, of Duluth, Mich., have purchased large fir timber areas on Vancouver Island, B.C., and will establish a mill there at once. The mill to be erected will have a capacity of 250,000 feet a day, representing in connection with the logging roads an expenditure of half a million dollars and the employment of 500 men.

Companies Incorporated.

W. F. Tait, C. L. Hannington and others, of Dorchester, N.B., are incorporated as the Dorchester Woodworking Company, with a capital of $12,000.

The Canada Tool Co. have been incorporated with head office in Montreal, to manufacture tools, electrical supplies, machinery articles and novelties. The capital stock is fixed at $20,000.

Letters of incorporation have been granted to A. W. Bennett, C. W. Fawcett, Frank B. Block and others, of Sackville, N.B., as the Sackville Woodworkers', Limited, with a capital of $24,000.

Electric Securities Co., Toronto; capital, $300,000; to manufacture and deal in electric machinery of all kinds. Provisional directors, A. M. Manson, J. M. Langstaff, J. A. Goudy, D. J. Cowan and C. L. Carin, all of Toronto.

James S. Gibbon, Charles S. Gibbon, William E. Vroom and N. S. Springer, of St. John, N.B., and Charles I. Sparker, of Newcastle, N.B., are incorporated as the Winterport Coal Mining Company, with a capital of $99,000.

The Canada Tool Co., Montreal, have been incorporated with a capital of $20,000, to manufacture tools, electrical supplies, machinery, articles, etc. The charter members include W. R. Hitchcock, C. H. Cline and R. S. Cline, Cornwall, Ont.

Canadian Northern Terminals, Limited, has been incorporated at Ottawa, with a capital stock of $2,000,000 and head office, Toronto, to construct and maintain terminals, hotels, docks, smelters, car shops, etc. Mackenzie and Mann are the incorporators.

Municipal Undertakings.

A court house will be erected at Battleford, Sask.

Plans are being prepared for the new power plant for Edmonton, Alta.

An electric lighting plant has just been installed at Wolseley, Sask.

$800,000 is to be spent in Vancouver during the coming year on improvements.

The ratepayers of Guelph, Ont., will vote on a by-law to raise $125,000 for waterworks.

Okotoks, Alta., is considering the acquisition of the local company's electric light plant.

A sewage and waterworks system will be installed at Edmonton, Alta., to cost $96,000.

The city of St. John, N.B., will issue debentures for $500,000 for public improvements.

The cost of the distribution of Niagara power for the city of Brantford, Ont., will be $67,000.

Brantford, Ont., will vote on a by-law for $55,000 debentures for a power distributing plant.

Tenders will be received by the Board of Control, Winnipeg, Man., for 15 miles of assorted waterpipe.

The electors of Stratford, Ont., will vote on a by-law to raise $35,000 for a power distributing plant.

Vancouver, B.C., will vote on a $150,000 money by-law to add a wing to the general hospital.

A by-law will be submitted to the ratepayers of Kingston, Ont., for $15,000 for a stone crushing outfit.

G. S. Hanes, city engineer, Windsor, is preparing plans for the construction of a number of new sewers.

The specifications have been received for the two new 6,000,000 gallon electric pumps for Hamilton, Ont.

The ratepayers of Woodstock, Ont., will vote on a by-law for $27,000 for a distributing plant for Niagara power.

The ratepayers of Napanee, Ont., will vote on a by-law to raise $10,000 for the extension of the lighting system.

The ratepayers of Deseronto, Ont., have approved a by-law granting a bonus of $20,000 to the Deseronto Furniture Company.

Calgary, Alta., has decided to submit a by-law granting $35,000 to the Dominion Fair, for the purpose of erecting buildings.

The cost of the contemplated extension to the waterworks system of New Westminster, B. C., has been estimated at $100,000.

A by-law will be submitted to the ratepayers of London, Ont., for the construction of a new fire hall to cost about $17,000.

The city council of Winnipeg carried an appropriation last month for the expenditure of another $22,000 on the power plant.

Kemptville, Ont., may apply for a charter to construct a railway from that town to the Grand Trunk line near South Indian, Ont.

Tenders have closed for the construction of Calgary, Alta., street railway system, which it is hoped will be completed within a year.

A by-law for $1,000,000 will be submitted to the ratepayers of Vancouver, B.C., for the construction of bridges. W. H. Creek, city engineer.

The Nepean, Ont., council have drawn up a by-law authorizing the raising of $10,000 for the erection of two steel bridges over the Jack river.

Collingwood has applied to the Ontario Municipal and Railway Board for the confirmation of a by-law to raise $3,800 for waterworks extension.

The ratepayers of St. Thomas, Ont., will vote on a by-law for a Niagara power distribution plant to cost $42,000. J. A. Ball is city engineer.

A by-law has been passed at Kelowna, B.C., authorizing the expenditure of $40,000 on extensions to the electric light plant and waterworks.

The Government of British Columbia will erect a provincial asylum at Coquitlam, B.C., to cost $200,000. Hon. F. J. Fulton is Provincial Secretary.

Engineer Aiken, of Toronto, has valued the electric lighting plant at Listowel, Ont., at $1,276. The citizens are considering the installation of a new plant.

The city council, Port Arthur, Ont., has authorized the purchase of a 250 horse-power motor generator, at a cost of $8,000, for additional street railway power.

A by-law to issue $16,000 30-year debentures to cover the cost of the plant to distribute electric power will be voted on by the ratepayers of Waterloo, Ont., on January 6.

Tenders will be received until Jan. 2 by the Board of Control, Winnipeg, Man., for the supply and installation of pumping and air compressing machinery. M. Peterson is secretary.

It is expected that the water system at New Liskeard, Ont., will be installed soon. The work on the mains has been completed, and the pumping machinery will be erected shortly.

Application has been made by the municipality of Parry Sound to the Ontario Railway and Municipal Board for confirmation of a by-law authorizing the extension of the electric light and waterworks.

The ratepayers of Fort William, Ont., on January 6 will vote on a by-law to issue $20,000 debentures for the extension and improvement of the electric light system. A. McNaughton, city clerk.

Ross & Holgate, electrical engineers, Montreal, have been asked to furnish a valuation of the Ingersoll Electric Power & Light Company's plant. Early in the year the company asked the council a sum of $50,000.

Tenders will be received until February 1st, 1908, for the works connected with the construction of Section No. 2, Ontario-Rice Lake division of the Trent canal. L. K. Jones, secretary Department of Public Works.

The council of London is presenting a by-law to raise $235,000 for the erection of buildings, machinery and equipment for the distribution of power to be supplied by the Hydro-Electric Commission from Niagara Falls.

The people of the city of Toronto will vote on a by-law on January 1st to raise $2,750,000 to cover the cost of plant, machinery and appliances for the distribution of electric power to be supplied from Niagara Falls by the Hydro-Electric Commission.

The municipal council, Cobalt, Ont., have granted a franchise for an electric railway to the Central Railway Company. A start on the construction of the Cobalt-Liskeard section will probably be made next spring. This section alone will cost in the neighborhood of $250,000.

Railroad Construction.

The Grand Trunk Pacific wants 600,000 ties for its line in the west.

The Canadian Northern has completed a new dock at Toronto which cost $150,000.

The Grand Trunk machine shop at London, Ont., is nearing completion. The machinery is nearly all installed.

The C.P.R. are changing the lighting system of their passenger coaches from acetylene to Pintsch gas.

The Canadian Northern will build ten branch lines. With one exception they will be in the western provinces.

The C.P.R. will electrify its South Kootenay branch in an effort to recover the coke, coal and ore haulage to the States.

By accepting the terms of the Grand Trunk Railway, Barrie, Ont., will acquire an addition to its industries. The railroad proposes to locate the shops for the northern division at that point.

The Grand Trunk Railway intends to establish at St. Lambert Junction, Montreal, a freight terminal which will be one of the most important in the country. For some time the company has been acquiring property along the main line, and the yard will probably be about three miles in length.

Building Notes.

A new post office will be erected at Welland, Ont.

The Boyd-Burns block, Vancouver, B.C., will cost $60,000.

A new rink will be erected at Fernie, B.C., to cost $15,700.

An armory will be erected at Belleville, Ont., to cost $75,000.

Victoria, B.C., will have a new public school to cost $30,000.

A new theatre will be erected at Winnipeg, Man., to cost $100,000.

The Bank of Commerce will build a new branch at Vancouver, B.C.

The new Royal Alexandra theatre, Edmonton, Alta., is to cost $150,000.

Bowser & Wilson, Vancouver, B.C., will erect a business block to cost $100,000.

About $70,000 will be spent in the construction of a hospital at London, Ont.

An addition will be erected to the Hamilton, Ont., drill hall, to cost $100,000.

Improvements will be made to the Walker House, Toronto, to cost $20,000.

Fire destroyed property at Little Current, Ont., to the extent of $70,000.

The T. Eaton Co., Toronto, will add two storeys to the recently completed addition to their premises.

The contract for the alterations to the Toronto post office has been awarded to G. Henry, Toronto, the contract price being $20,000.

A small power house is to be erected at the rear of the new addition to the general hospital, Edmonton, Alta., which is being built at a cost of $100,000.

The Montreal market committee will recommend to the council the construction of a new market in the northern part of the city at an estimated cost of $50,000.

Tenders have been called for the erection of St. Helen's church, Toronto, building, to commence in April. The new church will have a seating capacity of 900 and will cost $60,000.

The Imperial Theatre Co., Winnipeg, with a capital of $200,000, have applied for permits for the erection of a new theatre in Winnipeg to cost $100,000. The site for the theatre cost $90,000.

Building permits to the value of $638,150 were issued in Toronto during November. In November, 1906, the figures for the month were $1,087,692. The total permits for this year to date are for $13,618,785.

Mining.

The Granby mines and smelter, Nelson, B.C., re-opened lately with a staff of 1,200 men.

A New York syndicate has purchased 2,000 acres of land in the Nepigon, Ont., iron district.

The Dominion Iron & Steel Co., Sydney, N. S., have acquired the property of the New Brunswick Iron Co., at Lapreaux, N.B., and will develop the areas extensively.

The New Brunswick Provincial Government is offering ten acres of land free to miners who will settle in Minto, N.B. The conditions are that the miners erect a house and work in the mines for three years.

The Maritime Coal, Railway & Power Co., Chignecto, N.S., has taken over the Joggins mine and railway. They are doing extensive repairs, besides opening up a new slope, and are in great need of carpenters, miners and laborers.

Trade Notes.

The Northern Engineering Works, of Detroit, Mich., report export shipments of Newten cupolas to Havre, France, and to Genoa, Italy.

The Cranston Advertising Novelty Co. has moved into larger offices at 123 Bay street, to better look after the needs of their customers.

The Smart-Turner Machine Co., Hamilton, Ont., recently shipped four compound duplex pumps to the Leigh Portland Cement Co., Belleville, Ont.

The Sanderson, Harold Co., Paris Ont., recently made extensive improvements in their plant. A new boiler, engine and several woodworking machines have been installed.

The S. Obermoyer Co., Cincinnati, Ohio, have placed on the market an iron filler cement that they claim is perfected cement. They will send a sample of this material to anyone who makes a request for it.

The Chicago Flexible Shaft Co., 144 La Salle avenue, Chicago, have placed on the Canadian market a Stewart furnace for heating high-speed steels. This furnace burns any kind of gas or crude oil. A complete catalogue will be sent on application.

The Schaake Machine Works, Limited, of New Westminster, B.C., recently supplied a 72-inch by 18-foot horizontal return tubular boiler, made by the Canada Foundry Co., to the Brunette Saw Mills, Limited, Sapperton, B.C. They are also supplying two boilers of similar size and make to the North Arm Lumber Co., Ebурne, B.C.

The new foundry of the Clyde Iron Works, Duluth, will be operated by alternating current motors and will be equipped with two 10-ton and one 15-ton electric traveling cranes of about 40 feet span. These cranes are to be of the Northern type, equipped with alternating current motors, furnished by the Northern Engineering Works, of Detroit, Mich.

Owing to the increased sale of Thor Pneumatic Tools and Appliances on the Pacific coast the Independent Pneumatic Tool Co. have secured a large office and ware-room at 61 Fremont street, San Francisco. The new location is in the heart of the machinery district, and a complete line of pneumatic tools will be carried in stock.

The Sheffield Engineering Co. has opened up a Canadian office in Toronto. Mr. Brawley is the Canadian manager, with office in the Stair building, Bay street. They will open up show rooms shortly and will handle machine shop supplies, tools, power machinery and power plant equipment, electrical supplies, railway supplies, wire ropes, mining machinery, gas plants, etc.

Thomas W. Pangborn Co., New York, with factory and warehouse in Jersey City, manufacturers of and dealers in equipment and supplies for foundries, pattern and machine shops, boiler shops, etc., has been made into corporation of the same name. The capital is $60,000, and business under the corporation will begin January 1st. The officers are: Thomas W.

Pangborn, president and treasurer; John C. Pangborn, secretary.

The Ontario Iron & Steel Co., Welland, have orders for locomotive castings and are adding a large pipe mill to their works. Mr. Ross, superintendent of the Supreme Heating Co., has arrived from Quincey, Ill., and arrangements are being made to start the manufacture of stoves at once. Billings & Spencer have started manufacturing drop forgings, and the other industries are busy. Mr. Beatty & Sons have 300 hands at work and are manufacturing contractors' supplies.

John F. Allen, manufacturer of Allen riveting machines, 370-372 Gerard avenue, New York city, recently received a letter from Wm. P. McNeil & Co., New Glasgow, N.S., in which the following unsolicited testimonial regarding results obtained with an Allen riveter appears: "We have in use one of your 10-in. machines, 25-in. reach, which was bought from you in 1901, and which has worked almost continuously. We may say that this machine has never given us the slightest trouble and has cost practically nothing for repairs."

At the recent annual meeting of the stockholders of the Independent Pneumatic Tool Co., held at Jersey City, N.J., the following directors were re-elected for the ensuing year:— Messrs. James B. Brady and W. O. Jacquette, New York city; John P. Hopkins, John D. Hurley, James J. McCarthy, John M. Glenn, M. S. Rosenwold and Simon Florshein, Chicago, and John R. Turner, Jersey City. All of the officers were re-elected, with James B. Brady, Esq., president. An addition to their plant at Aurora will allow a larger output. The annual statement shows a gratifying increase in business over the previous year.

The Smart-Turner Machine Co., Ltd., of Hamilton, report several sales of their well-known line of duplex and centrifugal feed and power pumps. Among the firms recently installing these are: R. J. Loze, Chaudiere Junction, P. Q.; Brinten Carpet Co., Peterboro; Canada Wood Specialty Co., Orillia; Sheldon's, Ltd., Galt; E. Leonard & Sons, London, Ont.; R. F. Stevens, Halifax, N.S.; the American Locomotive Co., Montreal; Normal School, Hamilton; Hiram Walker & Sons, Walkerville, and J. E. Rathbun, Trenton, Ont. The G.T.P. terminal elevator at Midland, Ont., is to be equipped with a traveling crane built by the Smart-Turner Co., Ltd., Hamilton.

Plant Re-opened.

The Canadian Shipbuilding Company, at Bridgeburg, Ont., have recommenced work on their yards with about two hundred and fifty men. The plant had been closed down about a month.

Addition to Plant of Hamilton Steel and Iron Company.

The Hamilton Steel and Iron Company is erecting another big addition to its already extensive plant. A permit has been taken out for the construction of a machine shop. It will cost between $5,000 and $10,000.

Trade Enquiry.

The High Commissioner for Canada, 17 Victoria street, London, S.W., England, has received the following inquiry: The owner of a patent jack for elevating motor cars wishes to sell his patent rights for Canada and invites correspondence.

Hamilton's New Industry.

The P. L. Robertson Mfg. Co., Ltd., has been incorporated, with a capital of $250,000, for the purpose of manufacturing tacks, screws, etc. They will begin work at once on Lottridge St., until they erect a factory, which they expect to do at once.

C.N.R. New Shops at Winnipeg.

The civic inspector of buildings at Winnipeg has issued permits aggregating $50,000 to the C.N.R. These permits are for the erection of a foundry at the Fort Rouge shops; 129 by 100 feet, costing $30,000, and a power house, 160 by 53 feet, costing $20,000.

Fire in Stove Foundry.

The stove foundry of Burrow, Stewart and Milne, Hamilton, Ont., was damaged by fire on November 22. The building and contents were damaged to the extent of $15,000. This is the third serious fire the firm has suffered within the last few years.

Power Plant for Vancouver Island.

The B. C. Electric Railway Company propose erecting a power plant on the Jordan river, in the southwest corner of Vancouver Island, and develop the resources of the stream to provide light and power to supply the growing needs of the island. Surveys are now being made and it has been estimated that 20,000 horse-power can be developed at this point.

Gas Producer Plant at Edmonton.

A new gas producer plant, the largest power plant of its kind in Canada, will be located five miles from Edmonton. Plans and specifications are now being prepared under the direction of R. R. Keely, Edmonton, and an Allis-Chalmers producer gas engine of 600 k.w. capacity will be installed.

Extended Their Plant.

The B. Greening Wire Co., Ltd., Hamilton, have just completed extensive improvements on their factory. A new weaving mill, 260x130 feet has been erected and here is installed several new machines. It is the intention next year to build an addition to this new weaving mill with sufficient capacity to hold all the weaving machinery. The B. Greening Co., manufacture wire cloth for locomotive stacks, saw mills, and wire rope for elevators and all transmission of power.

C.P.R. Equipment.

During 1907 the C.P.R. expended $12,000,000 on rolling stock and equipment, besides greatly increasing their terminal facilities at Montreal, Toronto and Fort William, and providing additional track room along the whole system. The line between Montreal and Smith's Falls has been double-tracked and the coming year will see a great deal of work accomplished on the double tracking between Smith's Falls and Toronto.

Electric Power Installed.

The C.P.R. have abandoned steam power in the shops at Vancouver and substituted electric power, supplied by the B. C. Electric Railway Company. The demand is nominally for 225 horse-power, furnished by motors ranging from 75 horse-power down to 5. The plant was installed under the supervision of Mr. Chambers, C.P.R. electrical engineer, Winnipeg.

Cement Works for Markdale.

A proposition has been made to the council of Markdale, Ont., to erect a large cement factory at Bell's Lake, five miles northeast of Markdale. Here is an extensive bed of the finest marl and for certain concessions a company will erect a $1,500,000 plant. J. Graham, of Toronto, is the promoter.

Steel Welding by Thermet.

A heavy steel engine frame of one of the locomotives of the Inverness Railway & Coal Co. was successfully welded at Inverness by the thermit process. This interesting job was accomplished in their shops at Inverness, under the direction of Daniel Bell, foreman of the Dominion Coal Co.'s foundry at Glace Bay. William Abbott, 334 St. James street, Montreal, is the Canadian agent for thermit welding composition, which is being so successfully used for welding heavy steel castings.

Parkin Elevator Works, Hespeler.

The Parkin Elevator Works, Hamilton, have opened a plant at Hespeler, Ont., and have about fifty men employed manufacturing freight and passenger elevators. They have put up a two-storey building, 60x150 feet, which is used as machine and carpenter shops.

A foundry has also been erected 48x70 feet, equipped with an 8-ton cupola and other necessary equipment. It is their intention to make grey iron castings of every description. They have several orders for elevators, and the plant is busy.

Angus Shops, Montreal, Busy.

The pay roll of the locomotive department of the Angus shops for November was the second highest pay roll on record. The passenger car department is, if anything, busier than it has been for some months past. The whole state of activity all over the shops is such as would have been considered abnormally high two years ago. Every foot of rail space in the locomotive shop is occupied by its locomotives undergoing work, and every machine is being worked upon by a full gang of men.

Steel Tabular Axle Co., Limited.

The Ontario Steel Tubular Axle Co., Belleville, is the only firm in Canada manufacturing tubular axles. They have installed considerable machinery and are busy with a large order.

The tubular axles being made of steel hammered while hot under a spray of water gives a bearing so smooth and so hard that many years of use show no apparent wear. Tubular axles are provided with cast iron boxes of the best quality of grey iron, which gives them the advantage of the well-known principle that two metals of different texture wearing upon each other do so with much less friction than when of the same material.

The Steel Rail Demand.

The outlook for the steel trade of Canada is good. A careful calculation has been made by the railway engineers as to the quantity of steel rails which will be required in Canada during the next year, and it is stated that, including the orders already placed, ...0 tons of rails will be needed to meet the demands of all the roads, including the Grand Trunk Pacific. It is believed that the Soo will have about two hundred thousand tons of this demand to supply, and the balance, about one hundred and eighty thousand tons, will go to the Nova Scotia steel works.

New Engines for the Grand Trunk.

The G.T.R. has given orders for one hundred new locomotives to cost $1,500,000. Twenty Richmond compound consolidated engines, 30 simple road engines from the Locomotive & Machine Co., Montreal; 10 single mogul engines, 10 ten-wheel passenger engines, 10 switch engines, from the Baldwin Locomotive Works, and 20 simple road engines from the Canadian Foundry Co., Toronto. This large order on the part of the Grand Trunk will tend to allay the fears of those who believe in a period of financial depression. Work on these will commence at once.

Brass and Steel Goods, Limited.

The Brass & Steel Goods, Ltd., Belleville, have just completed new shops and are ready for the manufacture of all classes of brass and steel goods for trunks, store fixtures, house fixtures, yachts and brass and aluminum castings of all kinds. The capital is $150,000, and their machinery has been installed at a cost of $50,000. The main building is 150x45 feet, two storeys high and extra well lighted.

The foundry is 40 feet square, and has four furnaces running, and a total of eleven will be installed this winter.

The plant is heated by steam and power is obtained from the Trent river. In the machine shop is a full line of tool makers and machinists' equipment and power presses. This occupies the first floor and in the second floor is the plating and polishing department.

Huge Cement Plant.

The new plant of the Lakefield Portland Cement Company at Pointe aux Trembles will start operation in about two weeks, and will employ about 200 men.

The daily output for the present will be 2,000 barrels. Buildings are, however, constructed to house a plant of the capacity of 3,000 barrels a day, and it is the intention of the company to install the additional machines required for the enlarged output at an early date.

All of the 3,000 or more horse-power required to operate the immense undertaking is furnished by the Montreal Light, Heat and Power Co., being delivered to the works at a pressure of 10,000 volts. It is there received into three 1,000 kilowatt transformers and by these reduced to 550 volts, at which voltage the power is transmitted to thirty-two large induction motors scattered throughout the works, each of which operates some integral portion of the plant.

Bright Prospects for Bathurst, N.B.

Large iron deposits have been discovered at Bathurst and have been taken over by the Drummond Mines Co., of Londonderry, N.S. The ore is of good quality and from $150,000 to $200,000 will be spent in starting developments. Diamond drills will be immediately put on the property and as soon as tbe mine is in full operation there will be 250 to 300 men at work there.

A delegation from the Drummond Mines Co. asked the Government for the right to take Grand Falls, on the Nepisiquit river, for conducting mining operations. It is possible that the Drummond Mines Co., who have large industries in several places in Canada, will erect a blast furnace and afterwards a steel works at Bathurst, giving employment to about 1,000 men. The I.C.R. is being extended to the Bathurst mine, and the harbor is being dredged and improved.

Development of Quebec Industry.

The firm of F. X. Drolet, Quebec, bas grown to sucb an extent that it is now the largest firm in Quebec and covers a surface of 11,000 square feet in the beart of the city. A new addition along St. Joseph and Octave streets, bas been erected to supply the growing demands for his line of macbinery, which includes steam, boiler and fire pumps, automatic cut-off engines, stationary and marine engines, surface condensers, etc. Additional ground, 10,000 square feet, has been secured on the border of St. Charles river and bere another large building will be erected. A foundry will also be added and tbe contract for tbe building has been let to C. E. Morissette, and the work will begin the first of May, 1908. Mr. Drolet will establish a dockyard on the St. Charles river and has just completed a new patent slip, where boats will be repaired during the winter, thus giving employment to a still larger number of mechanics, carpenters and laborers.

More Power for Vancouver.

The new unit of the Vancouver Power Co., at Lake Buntzen, on the north arm of the inlet, is in place and almost ready for duty. The original plant consisted of four units of 3,000 horse-power, and the addition is 10,000 horse-power, costing $300,000. It is intended to add two more units of 10,000 horse-power immediately to utilize the full capacity of Lakes Buntzen and Coquitlam. This extension will mean an additional expenditure of $300,000. The Canadian Pipe Co., of Vancouver, installed the 600 feet of wood stave pipe 60 inches in diameter. Tben on the decline is 1,000 feet, 48-in. diameter steel pipe, manufactured by the Vancouver Engineering Works. A double line of these supplies the water to drive the four large Pelton water wbeels. The transformers, two of which will aggregate 7,500, and a third 3,500 h.p., and the generator were supplied by the Canadian General Electric Company and installed in the new cement power house. Power is distributed from this point to Vancouver, New Westminster and the B.C. Electric Railway.

Canadian Tap and Die Co.

The Canadian Tap & Die Co., whose factory is at Galt, has now been in operation a little over a year, and in that time they have worked up their stock of taps, dies, screw plates, etc.

The line of goods that they intend making is similar to those made by Wells Bros. Co., whose factory is at Greenfield, Mass. Tbe latter company is one which has been manufacturing taps and dies for something over a third of a century. Every tool that they make is put out under tbe trade mark, "Little Giant."

The Canadian Tap & Die Co. are licensed manufacturers of the "Little Giant" taps, dies, screw plates, etc.

"The "Little Giant" taps, dies and screw plates are not unknown to users in Canada. Tbey have been supplied so many years that they have become well known from one end of the Dominion to the other, and so there is no doubt whatever but what a number of our Canadian concerns will note with interest the establishment of their factory.

The fact that their tools are all being put out under the trade mark "Little Giant" is in itself a guarantee tbat the quality will be of the very best.

The company now has a large stock of taps and dies on hand, and are in a position to complete orders with promptness. They wish us to state that a copy of their catalogue will be sent to any one on receipt of request.

New G.T.R. Shops at Stratford.

The Grand Trunk Railway is making extensive additions to their Stratford shops. A machine and erecting shop 616 feet long by 175 feet wide is being erected, and a boiler shop 154 feet long by 135 feet wide is being added. The buildings are being constructed on concrete foundations and the walls are of reinforced concrete. The structural steel is being installed by the Canadian Bridge Co., of Walkerville.

The erecting plant is to be completed and is being equipped with a 120-ton electric traveling crane, which will span the engine pit bay and will move around the largest G.T.R. engines. R. Patterson, master mechanic, is superintending the installation of the locomotive construction and erecting shops.

Other large shops will be a storehouse 60x200 feet, a blacksmith shop 100x300 feet, and a power house 90x90 feet, and a foundry 110x140 feet. The new shops will be capable of repairing 28 engines at one time. The larger tools are to be driven by individual electric drive. Compressed air will be used for riveting machines, turn-table, forge fires, blowing out engines, etc. A complete fire system will be installed, with a 100,000-gallon tank to supply sufficient pressure for fire protection.

Rolling Stock Needed for Canadian Railways.

Each autumn tbere is a call from the farmers of western Canada for more cars, and each year the car shortage of Canada has been more apparent. With the building of the new Grand Trunk Pacific and the Cauada Northern rapidly pushing a transcontinental across the continent, the need of rolling stock will be still greater and it seems that if car shops were located somewhere in the west there would be a good market for the output of such a factory. The different railroad companies are willing to buy all the cars they can secure and at present the car shops in both Canada and United States are busy.

The Canada Northern has built a few freight cars and cabooses in Winnipeg, but not a great supply to meet the growing needs. The Canadian Pacific are using the whole floor area of their new Winnipeg plant for repairs. When this plant was erected the company had the building of cars in view and an addition to the present plant will have to be made if the manufacture of railroad equipment and rolling stock is to be carried on.

The C.P.R. shops, Montreal, find it more profitable to build electric street cars, and are so rushed with these orders that the output is only about 5,000 cars annually. British Columbia, in spite of her great timber resources, is not an available point for the manufacture of cars on account of the absence of iron and the long haulage to bring iron to the coast. The new car shops in Fort William is a good beginning, but there is still room for other plants for the manufacture of rolling stock if the demand for cars is to be supplied.

There are now in operation in Canada 25,500 miles of railway, and 5,000 miles are in course of construction, mostly in the west. Projects are under way involving 10,000 miles of new railway, costing three hundred billion dollars. The C.P.R. constructed 2,000 miles in the last three years, and it is expected that Canada's railway mileage will be doubled in the next three years. With this extension there is a greater market for cars than the present factories can supply. There is a good opening in Canada for a large plant for the manufacture of railway stock and rolling stock.

CATALOGUES.

CHUCKS.—Price list and catalogue describing fully the chucks manufactured by the Skinner Chuck Co., New Britain, Conn.

AIR LIFT PUMP.—Illustrated booklet from the Canadian Rand Co., Ltd., Sherbrooke, P. Q., describing the working of their air lift pump.

PRESSES.—Folder from the Ferracute Machine Co., Bridgeton, N.J., U.S.A., illustrating and describing several of their complete line of presses.

ELECTRICAL SUPPLIES.—Circular from the Canadian Westinghouse Co., Limited, Hamilton, Ont., No. 1139, describing starting and field rheostats.

TRACK APPLIANCES. — Catalogue from Cook's Standard Tool Co., Kalamazoo, Mich., describing track drills, tool grinder, automatic lowering jacks, etc.

LIFTING MAGNETS.—A fully illustrated catalogue describing the Cutler-Hammer Clutch Co., Milwaukee, Wis., U.S.A., lifting magnets and their new cable take-up device.

WELL-DRILLING MACHINERY — Illustrated catalogue from Listowel Drilling Machine Co., Listowel, Ontario, of their well-drilling machinery, with engines and accessories.

AIR BRAKE EQUIPMENTS.—Bulletins Nos. 1513 and 1514 from Allis-Chalmers Co., Milwaukee, Wis., showing construction of emergency valve and governor for air brake equipments.

SLOTTER.—A well illustrated booklet on good paper, describes the Dill slotter, manufactured by the Dill Slotter People (33rd Ward) Philadelphia, Pa., and shows the construction and mechanism of their slotters.

BELTS AND ROPES.—An 87-page booklet on belts and belt management, and the care of ropes, from the Cling-Surface Co., 1032-1048 Niagara street, Buffalo, N.Y., describing their cling-surface dressing for belts and ropes.

CALENDAR.—We are indebted to the Canadian Fairbanks for a 1908 calendar, the figures of which are in large, easy-read type. Each page contains some valuable information of the lines of machinery for which they are agents.

RIVETING MACHINE.—Catalogue, fully illustrated, from John F. Allen, 370-372 Gerard Ave., New York, describing their steam riveters, compression lever riveters, pneumatic boiler riveters, and showing cuts of the boiler riveter in use.

BOLTS, NUTS AND RIVETS.—Catalogue from the Toronto Bolt & Forging Co., Ltd., Toronto, Ont., illustrating and describing their full line of bolts, nuts, rivets, and wide range of forgings. It is a book of 170 pages, on good paper, and makes a good reference volume.

LAZIER VERTICAL GAS ENGINE.—A well-gotten-up catalogue with large illustrations of multiple cylinder type vertical gas engines, manufactured by Lazier Gas Engine Co., 190 Main street, Buffalo. The catalogue contains operating costs and detailed descriptions.

ELECTRIC TOOLS.—Bulletins 4 and 5 from the Cincinnati Electric Tool Co., Cincinnati, Ohio, describing their electrical, air-cooled portable drills for metals, wood and marble and electrical tool post grinders for use in machine tools.

ELECTRICAL SUPPLIES.—From tbe Canadian Westinghouse Co., Limited, bulletin 1096, illustrating and describing Westinghouse oil switches and circuit-breakers; 1130 the electrostatic volt-meter, and 1146 type E of electrolytic lightning arrester.

COMPRESSED AIR AND ELECTRICAL DEVICES.—Illustrated catalogue from Canadian Pilling Co., 180 St. James street, Montreal, sbowing their devices for the application of air and electrical power to hoists, cranes, railway turn-tables, etc.

GRINDING MACHINERY AND SPEED LATHES.—Catalogue No. 11 from J. G. Blount Co., Everett, Mass., witb descriptions and illustrations of their several double grinders and polishing machines equipped with self-oiling bearings, and their belt or motor-driven speed

STORAGE BATTERIES.—Catalogue of storage batteries for portable use, from tbe Westinghouse Machine Co., Pittsburg. This is the initial publication devoted exclusively to storage batteries for portable use. The catalogue is illustrated with tables of the different portable storage batteries.

MACHINE TOOLS.—Catalogue No. 45 illustrating and describing fully the line of machine tools manufactured by the Newton Machine Tool Works, 24th and Vine streets, Philadelphia, Pa. This is a splendid reference volume of 300 pages, printed on good paper, for boring macbines, cold saw cutting off machines, milling machines, slotters, etc.

OPEN TURRET LATHE.—A magnificent catalogue of the open turret lathe manufactured by Pratt and Whitney, Hartford, Conn, U.S.A. It is on good heavy paper and all the details and working parts of the lathe are very carefully illustrated and explained. This lathe is for work from the bar and on forgings and castings and tbe catalogue is most complete.

VESSELS OF VARIOUS TYPES.—A tastily printed 72-page catalogue from James Pollock Sons & Co., Ltd., engineers and ship contractors, London, England, showing a large number of different types of vessels representing sea and river service. The illustrations include steamers, stern wheel and side paddle steamers,

yachts, trawlers, dredges, etc. This catalogue is of use to any interested in marine work. The price of this catalogue is fixed at £2 2s.

WRENCHES.—Illustrated catalogue of Frank Mossberg Co., Attleboro, Mass,, U.S.A., describing their line of wrenches, punching and forming dies and special tools and machinery.

A statistical calendar for 1908 from Winnipeg gives the statements of growth and prosperity of this industrial and commercial centre during the past few years. This calendar shows that Winnipeg has 136 profitably working factories, 24 new industries having been added in the past two years.

TAPS AND DIES.—Catalogue from the Canadian Tap and Die Co., Ltd., Galt, Ontario, describing "Little Giant" taps, dies, tap wrenches and screw plates, with tables of standard threads. This is the Canadian branch of Wells Bros. Company, of Greenfield, Mass., whose more complete catalogue, No. 22, of "Little Giant" taps, dies, screw plates, bolt cutters, nut tappers, reamers, gauges and special tools has also been received. Each catalogue is on good paper, convenient size and makes a good reference volume.

BOOK REVIEWS.

THE PRACTICAL ENGINEERS' POCKET BOOK, 1908—Price, leather, gilt, with diary on ruled section paper, 1s 6d.; published by the Technical Publishing Co., 30 Cross St., Manchester, England.

This edition has had added information on several new topics, including superheated steam, steam turbine tests, cranes, etc. This book of 700 pages is to meet the needs of designer and engineer and is made up-to-date each year. It is a valuable publication for practical engineers.

ELECTRICAL ENGINEERS' POCKET BOOK, 1908—Price, leather, gilt with diary on ruled section paper, 1s 6d.; published by the Technical Publishing Co., 30 Cross street, Manchester, England.

The notes have been revised and brought up to the present requirements. The new features include aluminium conductors, efficiency of generation, and depreciation of plant and machinery, etc. It is a valuable work to those engaged in designing and equipping electrical machinery.

MECHANICAL WORLD POCKET DIARY AND YEAR BOOK—Price 6d, 390 pages, hard covers, well printed; published by Emmott & Co., Ltd., 65 King street, Manchester, England.

This book contains much valuable information on Superheating, Reverberatory and Reheating Furnaces, Condensing Plant, etc., and the work has been revised making this twenty-first annual addition very complete and much more convenient for use.

MACHINE SHOP WORK—By F. W. Turner, 200 pages, illustrated, published by the American School of Correspondence, Chicago, Ill. Price, $1.50.

This is a valuable work by a man of authority on the use of all machine shop tools and machinery. This book, as all others published by this school, are adapted for purposes of self instruction and home study, and we recommend this volume to apprentices wishing to succeed as a first-class mechanic.

MECHANICAL DRAWING—By Ervin Kenison, 160 pages, 140 illustrations; published by the American School of Correspondence, Chicago, Ill. Price, $1.

The book is intended as a means of self-help and explains the use of instruments, gives geometrical definitions, geometrical problems and projections. Lettering is explained and the work treats drawing from the elementary principles, making it a valuable book for self instruction.

SHOP NOTES—Volume IV. of Shop Notes from Popular Mechanics, Chicago. This volume contains its usual large number of notes on easy ways to do hard things in the machine shop. Every mechanic will find useful information in this volume.

A MONSTER ENGINE.

The largest turbine engine in Montreal has been installed at the power station of the Montreal Light, Heat & Power Co. It is a 1,500 kilowatt Westinghouse-Parson's steam turbine, and is good for a 50 per cent. overload, this being equivalent to 2,250 kilowatt, or 3,000 horse power. The length from end to end is 37 feet 1 inch, and the width is 7 feet 6 inches. The steam is supplied at 120 pounds pressure, and the condenser used is a jet condenser built by the John Macdougal Co., Montreal. The circulating pump is a centrifugal one, directly connected to a high speed Robb engine. The dry air pump is a Knowles pump, 10x16x18, and the condensing water is supplied from the Lachine Canal. The turbine is directly connected to a revolving Field A. C. generator 3 phase, 2,400 volts, 7,200 alternations, 6 poles, designed and built by the Westinghouse Machine Co. The turbine will be used by the Montreal Co. as a standby for the present water power plant.

CASSIER'S SPECIAL GAS POWER NUMBER.

The November issue of Cassier's Magazine was devoted to the development of gas power and of the internal combustion motor. The number is profusely illustrated and covers the subjects of utilization of waste gases from iron furnaces, suction gas producers, design and construction of modern gas engines, etc. It makes a good reference book on these subjects.

COALITE OR SMOKELESS COAL.

A method of distilling coal, which, it is claimed, will do away with the smoke nuisance, has been discovered by Thos. Parker, an eminent British engineer. Coalite is obtained by the distillation of bituminous coal and the process consists in carbonizing the coal for a period of eight hours in flat, rectangular retorts. The temperature is about 800 degrees F. and shows a dull red glow. The retorts are filled and the coal, on being heated, swells to a considerable pressure yielding a product of good density, while the low temperature prevents the whole of the volatile matter being expelled. The effect of the gentle distillation of coal in the preparation of coalite is that a gas is evolved with good illuminating power.

On account of the low temperature at which coalite is formed, the cost of plant maintenance is small. The by-products are valuable, one being a spirit which can be used as a motor fuel and can be sold at a lower price than gasolene.

Tests have shown that although coalite contains less heat units per pound of soft coal, a larger percentage of its heating value can be utilized. As the superfluous volatile elements have been removed coalite will not emit smoke during combustion. Patent rights have been obtained in all countries and it is the intention to erect several plants in Great Britain. A large site has been purchased on the Thames, England, where a large plant will be built to manufacture smokeless coal, or coalite.

THE ENGINEERING DIGEST.

The name of the Technical Literature of 220 Broadway, New York, has been changed to The Engineering Digest, this name being more applicable to this magazine.

DRAWING INSTRUMENTS AS PREMIUM.

Fred W. Dobe, chief draftsman, Engineers' Equipment Co., 95, 97 Washington St., Chicago, is offering the students in his home instruction course a complete drawing outfit, including a set of German silver instruments, as a premium for the best drawings made this month, January.

This home instruction system was modeled after practical schools of this kind in Germany, and is designed to meet the requirements of a practical education.

HE WAS A CARPENTER.

An Irishman out of work applied to the "boss" of a large repair shop in Detroit. When the Celt had stated his sundry and divers qualifications for a "job," the superintendent began quizzing him a bit. Starting quite at random, he asked.

"Do you know anything about carpentry?"

"Sure!"

"Do you know how to make a Venetian blind?"

"Sure!"

"How would you do it?"

"Sure, I'd poke me finger in his eye!"

A NEW INDUSTRY.

A teacher was asking the children what trades their fathers followed, but one little girl at first refused to tell. "Some, Rosie, you must tell," said the teacher.

"Well, ma'am, he's a worm-eater," said Rosie.

"A worm-eater?"

"Yes, ma'am. A worm-eater in an antique."

The puzzled teacher made a journey to Rosie's home and found it was all true. Her father's work was boring lifelike wormholes in imitation antique furniture to make it look genuine.—Youth's Companion.

INDUSTRIOUS.

Many men claim that they work with their heads instead of their hands. So does a woodpecker, and he is somewhat of a bore.

CANADIAN MACHINERY BUYERS' DIRECTORY

To Our Readers—Use this directory when seeking to buy any machinery or power equipment. You will often get information that will save you money.

To Our Advertisers—Send in your name for insertion under the heading of the lines you make or sell.

To Non-Advertisers—A nominal rate of $1 per line a year is charged non-advertisers.

Acids.
Canada Chemical Mfg. Co., London

Abrasive Grains & Powders
Carborundum Co., Niagara Falls, N.Y.

Abrasive Materials.
The Canadian Fairbanks Co., Montreal.
Rice Lewis & Son, Toronto.
Norton Co., Worcester, Mass.
H. W. Petrie, Toronto.
Carborundum Co., Niagara Falls, N.Y.
Williams & Wilson, Montreal.

Air Brakes.
Canada Foundry Co., Toronto
Canadian Westinghouse Co., Hamilton.

Air Receivers.
Allis-Chalmers-Bullock Montreal.
Canada Foundry Co., Toronto.
Canadian Rand Drill Co., Montreal.
John McDougall Caledonian Iron Works Co., Montreal.

Alundum Scythe Stones
Norton Company, Worcester, Mass.

Arbors.
Cleveland Twist Drill Co., Cleveland

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Automatic Machinery.
Cleveland Automatic Machine Co. Cleveland.
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Automobile Parts
Globe Machine & Stamping Co., Cleveland, Ohio.

Axle Cutters.
Butterfield & Co., Rock Island, Que.
A. B. Jardine & Co., Hespeler, Ont.

Axle Setters and Straighteners.
A. B. Jardine & Co., Hespeler, Ont.
Standard Bearings, Ltd., Niagara Falls

Babbit Metal.
Canada Metal Co., Toronto.
Canada Machinery Agency, Montreal.
Frothingham & Workman Ltd., Montreal
Greey Wm. & J. G., Toronto.
Rice Lewis & Son, Toronto.
Lumen Bearing Co., Toronto.

Bakers' Machinery.
Greey, Wm. & J. G., Toronto.

Baling Presses.
Perrin, Wm. R., & Co., Toronto.

Barrels, Steel Shop.
Cleveland Wire Spring Co., Cleveland.
Steel Trough & Machine Co., Tweed, Ont.

Barrels, Tumbling.
Detroit Foundry Supply Co., Windsor
Dominion Foundry Supply Co., Montreal
Hamilton Facing Mill Co., Hamilton.
Gilmour J. New York.
Globe Machine & Stamping Co., Cleveland, Ohio.
John McDougall Caledonian Iron Works Co., Montreal.
Northern Engineering Works, Detroit.
J. W. Paxson Co., Philadelphia, Pa.
H. W. Petrie, Toronto.
Sly, W. W., Mfg. Co., Cleveland
The Smart-Turner Mach. Co., Hamilton

Bars, Boring.
Hall Engineering Works, Montreal.
Niles-Bement-Pond Co., New York.
Standard Bearings Ltd., Niagara Falls

Bars, Grate.
Wilson, J. C., & Co., Glenora, Ont.

Batteries, Storage.
Canadian General Electric Co. Toronto
Rice Lewis & Son, Toronto.
John Millen & Son, Montreal.

Bearing Metals.
Lumen Bearing Co., Toronto

Bearings, Roller.
Standard Bearings, Ltd. Niagara Falls

Bearings, Self-Oiling.
Wilson, J. C., & Co., Glenora, Ont.

Belting, Chain.
Canada Machinery Exchange, Montreal.
Greey, Wm. & J. G., Toronto
Jeffrey Mfg. Co., Columbia, Ohio.
Waterous Engine Works Co., Brantford.

Belting, Cotton.
Canada Machinery Agency, Montreal.
Dominion Belting Co., Hamilton.
Rice Lewis & Son, Toronto.

Belt Dressing.
Stephenson Mfg. Co., Albany, N.Y.

Belting, Leather.
Canada Machinery Agency, Montreal.
The Canadian Fairbanks Co., Montreal.
Frothingham & Workman Ltd., Montreal
Greey, Wm. & J. G., Toronto
McLaren, J. C., Montreal.
Rice Lewis & Son, Toronto.
H. W. Petrie, Toronto.
Sadler & Haworth Montreal
Williams & Wilson, Montreal.

Belting, Rubber.
Canada Machinery Agency Montreal
Frothingham & Workman, Ltd., Montreal
Greey, Wm. & J. G., Toronto.

Belting Supplies.
Greey, Wm. & J. G., Toronto.
Rice Lewis & Son, Toronto.
H. W. Petrie, Toronto.

Bending Machinery.
John Bertram & Sons Co., Dundas, Ont.
Rice Lewis & Son, Toronto
London Mach. Tool Co., Hamilton, Ont.
National Machinery Co., Tiffin, Ohio.
Niles-Bement-Pond Co., New York.

Benders, Tire.
A. B. Jardine & Co., Hespeler, Ont.
London Mach. Tool Co., Hamilton, Ont.

Blowers.
Canada Machinery Agency, Montreal.
Detroit Foundry Supply Co., Windsor
Dominion Foundry Supply Co., Montreal
Gilmour, J. New York
Hamilton Facing Mill Co., Hamilton
Kerr Turbine Co., Wellsville, N.Y.
J. W. Paxson, Philadelphia, Pa.
Sheldon's Limited, Galt

Blast Gauges—Cupola.
Paxson, J. W., Co. Philadelphia.
Sheldons, Limited, Galt

Blocks, Tackle.
Frothingham & Workman Ltd., Montreal

Blocks, Wire Rope.
Frothingham & Workman, Ltd., Montreal

Blow-Off Tanks.
Darling Bros., Ltd., Montreal.

Boilers.
Canada Foundry Co., Limited, Toronto.
Canada Machinery Agency, Montreal.
Goldie & McCulloch Co., Galt.
John McDougall Caledonian Iron Works, Montreal.
Manitoba Iron Works, Winnipeg.
Owen Sound Iron Works Co., Owen Sound
H. W. Petrie, Toronto.
Robb Engineering Co. Amherst, N.S.
The Smart-Turner Mach. Co., Hamilton.
Waterous Engine Works Co., Brantford.
Williams & Wilson, Montreal.

Boiler Compounds.
Canada Chemical Mfg. Co., London, Ont.
Hall Engineering Works, Montreal.

Boiler Makers' Supplies.
Allen, John F. New York

Bolt Cutters.
John Bertram & Sons Co., Dundas, Ont.
London Mach. Tool Co., Hamilton
National Machinery Co., Tiffin, Ohio.
Niles-Bement-Pond Co., New York

Bolt Drivers.
Armstrong Bros. Tool Co., Chicago

Bolt and Nut Machinery.
John Bertram & Sons Co., Dundas, Ont.
Canada Machinery Agency, Montreal.
Rice Lewis & Son, Toronto.
London Mach. Tool Co., Hamilton.
National Machinery Co., Tiffin, Ohio.
Niles-Bement-Pond Co. New York.
Waterbury Farrell Foundry & Machine Co., Waterbury Conn.

Boring & Drilling Machines
American Tool Works Co., Cincinnati.
John Bertram & Sons Co., Dundas, Ont.
Canada Machinery Agency Montreal.
A. B. Jardine & Co., Hespeler, Ont.
London Mach. Tool Co., Hamilton
Niles-Bement-Pond Co., New York.

Boring Machine, Upright.
American Tool Works Co., Cincinnati.
John Bertram & Sons Co., Dundas, Ont.
London Mach. Tool Co., Hamilton.
Niles-Bement-Pond Co., New York.

Boring Machine, Wood.
Independent Pneumatic Tool Co., Chicago, Ill.
London Mach. Tool Co., Hamilton.

Boring and Turning Mills.
American Tool Works Co., Cincinnati.
John Bertram & Sons Co., Dundas, Ont.
Canada Machinery Agency, Montreal.
Gisholt Machine Co., Madison, Wis.
Rice Lewis & Son, Toronto
London Mach. Tool Co., Hamilton.
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.
Rice Lewis & Son, Toronto

Boring Tools.
Armstrong Bros. Tool Co., Chicago

Box Puller.
A. B. Jardine & Co., Hespeler, Ont.

Boxes, Lathe.
Steel Trough & Machine Co., Tweed, Ont

Boxes, Steel Shop.
Cleveland Wire Spring Co., Cleveland.
Steel Trough & Machine Co., Tweed, Ont

Boxes, Tote.
Cleveland Wire Spring Co., Cleveland

Brass Foundry Equipment.
Ph. Bonvillain & E. Ronceray, Philadelphia
Detroit Foundry Supply Co., Detroit.
Dominion Foundry Supply Co. Montreal
Paxson, J. W., Co., Philadelphia

Brass Working Machinery.
Warner & Swasey Co., Cleveland, Ohio.

Brushes, Foundry and Core.
Detroit Foundry Supply Co., Windsor.
Dominion Foundry Supply Co., Montreal
Hamilton Facing Mill Co., Hamilton.
Paxson, J. W., Co., Philadelphia

Brushes, Steel.
Dominion Foundry Supply Co., Montreal
Paxson, J. W., Co., Philadelphia

Bulldozers.
John Bertram & Sons Co., Dundas, Ont.
London Mach. Tool Co., Hamilton, Ont
National Machinery Co., Tiffin, Ohio.
Niles-Bement-Pond Co., New York.

Cabinets, Lathe Tools.
Armstrong Bros. Tool Co., Chicago

Calipers.
Frothingham & Workman Ltd., Montreal
Rice Lewis & Son, Toronto.
John Millen & Son, Ltd., Montreal Que.
L. S. Starrett & Co., Athol, Mass.
Williams & Wilson Montreal.

Canners' Machinery.
Wilson, J. C., & Co., Glenora, Ont.

Carbon.
Dominion Foundry Supply Co., Montreal

Carborundum Paper and Cloth.
Carborundum Co., Niagara Falls, N.Y.

Cars, Foundry.
Detroit Foundry Supply Co., Windsor
Dominion Foundry Supply Co., Montreal
Hamilton Facing Mill Co., Hamilton.
Paxson, J. W., Co., Philadelphia

Castings, Aluminum.
Lumen Bearing Co., Toronto

Castings, Brass.
Chadwick Bros., Hamilton
Greey Wm. & J. G. Toronto.
Hall Engineering Works, Montreal.
Kennedy Wm., & Sons, Owen Sound.
Lumen Bearing Co., Toronto
Niagara Falls Machine & Foundry Co. Niagara Falls, Ont.
Owen Sound Iron Works Co., Owen Sound.
Robb Engineering Co., Amherst, N.S.
Wilson J. C., & Co., Glenora, Ont.

Castings, Grey Iron.
Allis-Chalmers-Bullock Montreal.
Crowe's Iron Works Guelph, Ont.
Greey Wm. & J. G., Toronto
Hall Engineering Works, Montreal.
Kennedy, Wm. & Sons, Owen Sound.
Laurie Engine & Machine Co., Montreal.
Maxwell, David, & Sons, St. Marys.
John McDougall Caledonian Iron Works Co., Montreal.
Niagara Falls Machine & Foundry Co., Niagara Falls, Ont
Owen Sound Iron Works Co., Owen Sound.
Robb Engineering Co., Amherst, N.S.
Smart-Turner Machine Co., Hamilton.
Wilson, J. C., & Co., Glenora, Ont.

Castings, Phosphor Bronze.
Lumen Bearing Co., Toronto

Castings, Steel.
Kennedy, Wm., & Sons, Owen Sound.

Castings, Semi-Steel.
Robb Engineering Co., Amherst, N.S.

Cement Machinery.
Allis-Chalmers-Bullock, Limited, Montreal
Greey, Wm. & J. G., Toronto
Jeffrey Mfg. Co., Columbus, Ohio.
John McDougall Caledonian Iron Works Co., Montreal
Owen Sound Iron Works Co., Owen Sound

Centreing Machines.
John Bertram & Sons Co., Dundas, Ont.
Jeffrey Mfg. Co., Columbia Ohio
London Mach. Tool Co., Hamilton, Ont.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Hartford, Conn.
Standard Bearings, Ltd., Niagara Falls

Centres, Planer.
American Tool Works Co., Cincinnati.

Centrifugal Pumps.
Gas & Electric Power Co., Toronto
John McDougall Caledonian Iron Works Co., Montreal
Pratt & Whitney Co., Hartford, Conn.

Centrifugal Pumps—Turbine Driven
Kerr Turbine Co., Wellsville, N.Y.

Chain, Crane and Dredge.
Frothingham & Workman, Ltd., Montreal

Chaplets.
Detroit Foundry Supply Co , Windsor.
Dominion Foundry Supply Co., Montreal
Hamilton Facing Mill Co., Hamilton.
Paxson, J. W., Co., Philadelphia

Charcoal.
Detroit Foundry Supply Co., Windsor.
Doggett, Stanley, New York
Dominion Foundry Supply Co., Montreal
Hamilton Facing Mill Co., Hamilton.
Paxson, J. W.. Co., Philadelphia

Charcoal Facings.
Doggett, Stanley New York

Chemicals.
Canada Chemical Co., London.

Chemists' Machinery.
Greey Wm & J. G., Toronto

Chemists, Industrial.
Detroit Testing Laboratory Detroit.

Chemists, Metallurgical.
Detroit Testing Laboratory, Detroit.

Chemists, Mining.
Detroit Testing Laboratory, Detroit.

Chucks, Ring Grinding.
A. B. Jardine & Co., Hespeler, Ont.

Chucks, Drill and Lathe.
American Tool Works Co., Cincinnati.
John Bertram & Sons Co., Dundas, Ont.
Canada Machinery Agency, Montreal.
Cleveland Twist Drill Co., Cleveland
Frothingham & Workman, Ltd., Montreal
Hamilton Tool Co , Hamilton, Ont,
Ker & Goodwin, Brantford.
A. B. Jardine & Co., Hespeler, Ont.
London Mach. Tool Co., Hamilton.
John Millen & Son, Ltd. Montreal.
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.
Rice Lewis & Son, Toronto.
Standard Tool Co., Cleveland.

Chucks, Planer.
American Tool Works Co., Cincinnati.
Canada Machinery Agency, Montreal.
Niles-Bement-Pond Co., New York.

Chucking Machines.
American Tool Works Co., Cincinnati.
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.
Warner & Swasey Co , Cleveland, Ohio

Circuit Breakers.
Allis-Chalmers-Bullock, Limited, Montreal
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Canadian Westinghouse Co., Hamilton.
Gas & Electric Power Co , Toronto.

Clippers, Bolt.
Frothingham & Workman Ltd. Montreal
A. B. Jardine & Co., Hespeler, Ont.

Cloth and Wool Dryers.
Dominion Heating and Ventilating Co., Hespeler.
B. Greening Wire Co., Hamilton.
Sheldons Limited, Galt

Coal Boring Machines.
Cumming, J. W., New Glasgow, N.S.

Coal Miners' Tools.
Cumming, J. W , New Glasgow, N.S.

Collectors, Pneumatic.
Sheldons Limited, Galt

Compressors, Air.
Allis-Chalmers-Bullock, Limited, Montreal
Canada Foundry Co., Limited, Toronto.
Canada Machinery Agency Montreal.
Canadian Rand Drill Co., Montreal.
Canadian Westinghouse Co., Hamilton.
Darling Bros., Ltd., Montreal
Detroit Foundry Supply Co Windsor.
Gas & Electric Power Co., Toronto.
John McDougall, Caledonian Iron Works Co , Montreal
H. W. Petrie, Toronto.
The Smart-Turner Mach. Co., Hamilton.
Hall Engineering Works, Montreal, Que.
London Mach. Tool Co., Hamilton.
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.
Pratt & Whitney Co., Hartford, Conn.
Williams & Wilson, Montreal.

Concentrating Plant.
Allis-Chalmers-Bullock, Montreal.
Greey, Wm. & J. G., Toronto.

Concrete Mixers.
Jeffrey Mfg. Co., Columbus, Obio.

Condensers.
Canada Foundry Co., Limited, Toronto.
Canada Machinery Agency, Montreal.
Hall Engineering Works Montreal.
Smart-Turner Machine Co., Hamilton.
Waterous Engine Co., Brantford.

Confectioners' Machinery.
Greey, Wm. & J G. Toronto.

Consulting Engineers.
Connor, A. W , Toronto
Hall Engineering Works, Montreal.
Jules De Clercy, Montreal.
Roderick J. Parke, Toronto.
T. Pringle & Son, Montreal.
Standard Bearings, Ltd , Niagara Falls

Contractors.
Expanded Metal and Fireproofing Co. Toronto.
Gas & Electric Power Co , Toronto.
Hall Engineering Works Montreal.
Laurie Engine & Machine Co., Montreal
John McDougall Caledonian Iron Works Co., Montreal
Robb Engineering Co Amherst N S.
The Smart-Turner Mach. Co., Hamilton.
Steel Trough & Machine Co., Tweed, Ont.

Contractors' Plant.
Allis-Chalmers-Bullock, Montreal.
John McDougall, Caledonian Iron Works Co., Montreal.
Niagara Falls Machine & Foundry Co., Niagara Falls, Ont.

Controllers and Starters Electric Motor.
Allis-Chalmers-Bullock, Montreal.
Canadian General Electric Co., Toronto.
Canadian Westinghouse Co., Hamilton.
Gas & Electric Power Co , Toronto
T. & H. Electric Co., Hamilton.

Converters, Steel.
Northern Engineering Works, Detroit.
Paxson, J. W., Co., Philadelphia

Conveyor Machinery.
Greey Wm & J. G., Toronto
Jeffrey Mfg. Co., Columbus, Ohio.
Laurie Engine & Machine Co., Montreal.
Rice Lewis & Son, Toronto
John McDougall Caledonian Iron Works Co., Montreal.
Smart-Turner Machine Co., Hamilton.
Waterous Engine Works Co , Brantford.
Williams & Wilson, Montreal.
Wilson, J. C. & Co., Glenora, Ont

Coping Machines.
John Bertram & Sons Co., Dundas, Ont.
London Mach. Tool Co., Hamilton.
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Core Compounds.
Buffalo Foundry Supply Co., Buffalo.
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Paxson, J. W., Co., Philadelphia

Core-Making Machines.
Paxson, J. W.. Co., Philadelphia

Core Ovens.
Detroit Foundry Supply Co., Windsor.
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Hamilton Facing Mill Co. Hamilton.
Paxson, J. W., Co., Philadelphia
Sheldons Limited, Galt

Core Oven Bricks.
Detroit Foundry Supply Co., Windsor.
Dominion Foundry Supply Co. Montreal
Hamilton Facing Mill Co , Hamilton.
Paxson, J. W., Co., Philadelphia

Core Sand Cleaners.
Sly, W. W., Mfg. Co , Cleveland

Core Wash.
Detroit Foundry Supply Co., Windsor.
Dominion Foundry Supply Co., Montreal
Hamilton Facing Mill Co., Hamilton.
Paxson, Co., J. W. Philadelphia

Counterbores.
Cleveland Twist Drill Co., Cleveland

Couplings.
Owen Sound Iron Works Co , Owen Sound
Wilson, J. C., & Co. Glenora Ont

Couplings, Air.
Independent Pneumatic Tool Co., Chicago

Cranes, Electric and Hand Power.
Canada Foundry Co., Limited Toronto
Canadian Pilling Co , Montreal
Dominion Foundry Supply Co., Montreal
Gas & Electric Power Co Toronto
Gilmour, J., New York
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John McDougall, Caledonian Iron Works Co., Montreal.
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Northern Engineering Works Detroit
Owen Sound Iron Works Co , Owen Sound
Paxson, J. W., Co , Philadelphia
Smart-Turner-Machine Co., Hamilton.

Crank Pin.
Sight Feed Oil Pump Co., Milwaukee, Wis.

Crankshafts.
St. Clair Bros., Galt

Crabs.
Frothingham & Workman, Ltd., Montreal

Crank Pin Turning Machine
London Mach. Tool Co , Hamilton.
Niles-Bement-Pond Co., New York.

Cross Head Pin.
Sight Feed Oil Pump Co., Milwaukee, Wis.

Crucibles.
Detroit Foundry Supply Co , Windsor
Dominion Foundry Supply Co., Montreal
Hamilton Facing Mill Co., Hamilton.
J W Paxson Co., Philadelphia.
Seidel R. B., Inc. Philadelphia

Crucible Caps
Dominion Foundry Supply Co Montreal
Hamilton Facing Mill Co , Hamilton.
Paxson, J. W , Co , Philadelphia

Crushers, Rock or Ore.
Allis-Chalmers-Bullock, Montreal.
Jeffrey Mfg. Co., Columbus, Ohio.

Cupolas.
Detroit Foundry Supply Co , Windsor
Dominion Foundry Supply Co., Montreal
Gilmour J. New York.
Hamilton Facing Mill Co., Hamilton.
Northern Engineering Works, Detroit
J. W. Paxson Co. Philadelphia.
Sheldons Limited, Galt.

Cupola Blast Gauges.
Dominion Foundry Supply Co., Montreal
Paxson J. W.. Co., Philadelphia
Sheldons Limited, Galt

Cupola Blocks.
Detroit Foundry Supply Co., Detroit.
Hamilton Facing Mill Co., Hamilton
Gilmour, J. New York.
Northern Engineering Works Detroit
Ontario Lime Association, Toronto
Paxson, J. W. Co , Philadelphia
Toronto Pottery Co., Toronto

Cupola Blowers.
Canada Machinery Agency, Montreal.
Detroit Foundry Supply Co.. Windsor
Dominion Foundry Supply Co Montreal
Dominion Heating and Ventilating Co., Hespeler
Hamilton Facing Mill Co., Hamilton.
Northern Engineering Works, Detroit
Paxson J. W , Co., Philadelphia
Sheldon's Limited, Galt.

Cutters, Flue
Independent Pneumatic Tool Co., Chicago Ill.
J. W. Paxson Co Philadelphia.

Cutter Grinder Attachment.
Cincinnati Milling Machine Co., Cincinnati

Cutter Grinders, Plain.
Cincinnati Milling Machine Co., Cincinnati

Cutter Grinders, Universal.
Cincinnati Milling Machine Co., Cincinnati

Cutters, Milling.
Becker, Brainard Milling Machine Co. Hyde Park, Mass.
Cleveland Twist Drill Co., Cleveland
Frothingham & Workman Ltd. Montreal
Hamilton Tool Co , Hamilton, Ont.
Pratt & Whitney Co.. Hartford, Conn.
Standard Tool Co., Cleveland.

Cutting-off Machines.
Armstrong Bros. Tool Co., Chicago
John Bertram & Sons Co., Dundas, Ont.
Canada Machinery Agency, Montreal.
London Mach Tool Co., Hamilton.
H. W. Petrie, Toronto.
Pratt & Whitney Co., Hartford, Conn.

Cutting-off Tools.
Armstrong Bros. Tool Co., Chicago.
London Mach. Tool Co., Hamilton.
H. W. Petrie, Toronto.
Pratt & Whitney, Hartford, Conn.
Rice Lewis & Son, Toronto.
L. S. Starrett Co., Athol, Mass.

Damper Regulators.
Darling Bros., Ltd., Montreal

Dies
Brown, Boggs Co., Hamilton
Ferracute Machine Co , Bridgeton, N J.
Globe Machine & Stamping Co., Cleveland, Ohio.

Die Stocks
Curtis & Curtis Co., Bridgeport, Conn.
Hart Manufacturing Co., Cleveland, Ohio

Dies, Opening
W. H. Banfield & Sons, Toronto
Globe Machine & Stamping Co., Cleveland, Ohio.
Pratt & Whitney Co., Hartford, Conn.

Dies, Sheet Metal.
W. H. Banfield & Sons Toronto.
Bliss, E. W., Brooklyn, N.Y.
Globe Machine & Stamping Co Cleveland Ohio

Dies, Threading,
Frothingham & Workman, Ltd , Montreal
Hart Mfg. Co , Cleveland
John Millen & Son, Ltd , Montreal.

Draft, Mechanical.
W. H. Banfield & Sons, Toronto.
Butterfield & Co . Rock Island, Que.
A B. Jardine & Co Hespeler
Pratt & Whitney Co., Hartford, Conn.
Sheldons Limited, Galt.

Drawing Instruments.
Rice Lewis & Son, Toronto.

Drawn Steel, Cold.
Greey. Wm. & J. G., Toronto
Union Drawn Steel Co., Hamilton.

Drill Holders.
Armstrong Bros Tool Co., Chicago

Drilling Machines, Arch Bar.
John Bertram & Sons Co., Dundas, Ont.
London Mach. Tool Co., Hamilton
Niles-Bement-Pond Co., New York.

Drilling Machines, Boiler.
American Tool Works Co., Cincinnati.
John Bertram & Sons Co., Dundas, Ont.
Bickford Drill and Tool Co., Cincinnati.
The Canadian Fairbanks Co., Montreal.
A. B. Jardine & Co., Hespeler, Ont.
London Mach. Tool Co., Hamilton, Ont.
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.
Williams & Wilson, Montreal

Drilling Machines Connecting Rod.
John Bertram & Sons Co., Dundas, Ont.
London Mach. Tool Co., Hamilton.
Niles-Bement-Pond Co. New York.

Drilling Machines, Locomotive Frame.
American Tool Works Co., Cincinnati.
John Bertram & Sons Co., Dundas, Ont.
London Mach. Tool Co., Hamilton, Ont.
Niles-Bement-Pond Co., New York.

Drilling Machines, Multiple Spindle.
American Tool Works Co., Cincinnati.
John Bertram & Sons Co., Dundas, Ont.
Bickford Drill & Tool Co., Cincinnati.
Canada Machine y Agency Montreal.
London Mach. Tool Co., Hamilton, Ont.
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.
Rice Lewis & Son, Toronto
Williams & Wilson, Montreal.

Drilling Machines, Pneumatic
Canada Machinery Agency, Montreal.
Independent Pneumatic Tool Co., Chicago, Ill.

Drilling Machines, Portable
A. B. Jardine & Co., Hespeler, Ont.
Niles-Bement-Pond Co , New York.

Drilling Machines, Radial.
American Tool Works Co , Cincinnati.
John Bertram & Sons Co., Dundas, Ont.
Bickford Tool & Drill Co., Cincinnati.
The Canadian Fairbanks Co., Montreal.
London Mach. Tool Co., Hamilton.
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.
Williams & Wilson, Montreal.

Drilling Machines, Suspension.
John Bertram & Sons Co., Dundas, Ont.
Canada Machinery Agency Montreal.
London Mach. Tool Co., Hamilton.
Niles-Bement-Pond Co New York.

Drilling Machines, Turret.
John Bertram & Sons Co., Dundas, Ont.
London Mach. Tool Co., Hamilton.
Niles-Bement-Pond Co., New York.

Drilling Machines, Upright.
American Tool Works Co., Cincinnati.
John Bertram & Sons Co., Dundas, Ont
Dwight Slate Machine Co., Hartford
Hamilton Tool Co. Hamilton, Ont.
A. B. Jardine & Co., Hespeler, Ont.
Rice Lewis & Son, Toronto.
London Mach. Tool Co., Hamilton.
Niles-Bement-Pond Co., New York.
W. H. Petrie, Toronto.
Williams & Wilson Montreal.

Drills, Bench.
Hamilton Tool Co , Hamilton, Ont
London Mach. Tool Co., Hamilton.
Pratt & Whitney Co., Hartford, Conn.

Drills, Blacksmith.

Canada Machinery Agency, Montreal.
Frothingham & Workman, Ltd., Montreal
A. B. Jardine & Co., Hespeler, Ont.
London Mach. Tool Co., Hamilton.
Standard Tool Co., Cleveland.

Drills, Centre.

Cleveland Twist Drill Co., Cleveland
Pratt & Whitney Co., Hartford, Conn.
Standard Tool Co., Cleveland, O.
L. S. Starrett Co., Athol, Mass.

Drills, Coal and Plaster.

Cumming, J. W., New Glasgow, N.S.

Drills, Electric

Canadian Pilling Co., Montreal
Gas & Electric Power Co., Toronto.
Niles-Beuent-Pond Co., New York.

Drills, Gang.

American Tool Works Co., Cincinnati.
John Bertram & Sons Co., Dundas, Ont.
Pratt & Whitney Co., Hartford, Conn.

Drills, High Speed.

Wm. Abbott, Montreal.
Frothingham & Workman, Ltd., Montreal
Alexander Gibb, Montreal.
Pratt & Whitney Co., Hartford, Conn.
Standard Tool Co., Cleveland, O.

Drills, Hand.

A. B. Jardine & Co., Hespeler, Ont.

Drills, Horizontal.

John Bertram & Sons Co., Dundas, Ont
Canada Machinery Agency, Montreal.
London Mach. Tool Co., Hamilton.
Niles-Bement-Pond Co., New York.

Drills, Pneumatic.

Allen, John F., New York
Canada Machinery Agency, Montreal.
Independent Pneumatic Tool Co., Chicago, New York
Niles-Bement-Pond Co., New York

Drills, Radial.

American Tool Works Co., Cincinnati.
John Bertram & Sons Co., Dundas, Ont.
Bickford Drill & Tool Co., Cincinnati
London Mach. Tool Co., Hamilton, Ont.
Niles-Bement-Pond Co., New York.

Drills, Ratchet.

Armstrong Bros. Tool Co., Chicago.
Cleveland Twist Drill Co., Cleveland
Frothingham & Workman, Ltd., Montreal
A. B. Jardine & Co., Hespeler,
Pratt & Whitney Co., Hartford, Conn.
Standard Tool Co., Cleveland.

Drills, Rock.

Allis-Chalmers-Bullock, Montreal.
Canadian Rand Drill Co., Montreal.
Jaffrey Mfg. Co., Columbus, Ohio.

Drills, Sensitive.

American Tool Works Co., Cincinnati.
Canada Machinery Agency, Montreal.
Dwight Slate Machine Co., Hartford.
Niles-Bement-Pond Co., New York

Drills, Twist.

Cleveland Twist Drill Co., Cleveland
Frothingham & Workman, Ltd., Montreal
Alex. Gibb, Montreal.
A. B. Jardine & Co., Hespeler, Ont.
John Millen & Son, Ltd., Montreal.
Morse Twist Drill and Machine Co., New Bedford, Mass.
Pratt & Whitney Co., Hartford, Conn.
Standard Tool Co., Cleveland.

Drying Apparatus of all Kinds.

Dominion Heating & Ventilating Co., Hespeler
Greey, Wm. & J. G., Toronto
Sheldons Limited, Galt

Dry Kiln Equipment.

Sheldons Limited, Galt

Dry Sand and Loam Facing.

Dominion Foundry Supply Co., Montreal
Hamilton Facing Mill Co., Hamilton.
Paxson, J. W., Co., Philadelphia

Dump Cars.

Canada Foundry Co., Limited, Toronto
Dominion Foundry Supply Co., Montreal
Greey, Wm. & J. G., Toronto
Hamilton Facing Mill Co., Hamilton.
John McDougall, Caledonian Iron Works Co., Montreal.
Niles-Bement-Pond Co., New York
Standard Bearings, Ltd., Niagara Falls.
John McDougall Caledonian Iron Works Co., Montreal
Owen Sound Iron Works Co., Owen Sound
Paxson, J. W., Co., Philadelphia
Waterous Engine Co., Brantford

Dust Arresters.

Sly, W. W., Mfg. Co., Cleveland

Dust Separators.

Dominion Heating and Ventilating Co., Hespler.
Greey, Wm. & J. G., Toronto
Paxson, J. W., Co., Philadelphia
Sheldon's Limited, Galt.

Dynamos.

Allis-Chalmers-Bullock, Montreal.
Canadian General Electric Co., Toronto.
Canadian Westinghouse Co., Hamilton.
Consolidated Electric Co., Toronto
Electrical Machinery Co., Toronto.
Gas & Electric Power Co., Toronto
Hall Engineering Works, Montreal, Que.
John Millen & Son, Ltd., Montreal.
Packard Electric Co., St. Catharines.
H. W. Petrie, Toronto.
T. & H. Electric Co., Hamilton.

Dynamos—Turbine Driven.

Gas & Electric Power Co., Toronto.
Kerr-Turbine Co., Wellsville, N.Y.

Economizer, Fuel.

Dominion Heating & Ventilating Co., Hespeler
Standard Bearings, Ltd., Niagara Falls

Electrical Instruments.

Canadian Westinghouse Co., Hamilton.
Gas & Electric Power Co., Toronto.

Electrical Supplies.

Canadian General Electric Co., Toronto.
Canadian Westinghouse Co., Hamilton.
Gas & Electric Power Co., Toronto
London Mach. Tool Co., Hamilton, Ont.
John Millen & Son, Ltd., Montreal
Packard Electric Co., St. Catharines.
T. & H. Electric Co., Hamilton.

Electrical Repairs

Canadian Westinghouse Co., Hamilton.
T. & H. Electric Co., Hamilton.

Elevator Buckets.

Greey, Wm. & J. G., Toronto
Jeffrey Mfg. Co., Columbus, Ohio.

Emery and Emery Wheels.

Dominion Foundry Supply Co., Montreal
Frothingham & Workman, Ltd., Montreal
Hamilton Facing Mill Co., Hamilton.
Paxson, J. W. Co., Philadelphia

Emery Wheel Dressers.

Canada Machinery Agency, Montreal.
Dominion Foundry Supply Co., Montreal
Frothingham & Workman Ltd., Montreal
Hamilton Facing Mill Co., Hamilton.
John Millen & Son, Ltd., Montreal.
H. W. Petrie, Toronto.
Paxson, J. W., Co., Philadelphia
Standard Tool Co., Cleveland.

Engineers and Contractors.

Canada Foundry Co., Limited, Toronto.
Darling Bros., Ltd., Montreal
Gas & Electric Power Co., Toronto.
Greey, Wm. & J. G., Toronto
Hall Engineering Works, Montreal.
Laurie Engine & Machine Co., Montreal.
John McDougall, Caledonian Iron Works Co., Montreal.
Robb Engineering Co., Amherst, N.S.
The Smart-Turner Mach. Co., Hamilton.

Engineers' Supplies.

Frothingham & Workman, Ltd., Montreal
Greey, Wm. & J. G., Toronto
Hall Engineering Works, Montreal.
Rice Lewis & Son, Toronto.

Engines, Gas and Gasoline.

Canada Foundry Co., Toronto.
Canada Machinery Agency, Montreal.
The Canadian Fairbanks Co., Montreal.
Gas & Electric Power Co., Toronto
Gilson Mfg. Co., Guelph
The Goldie & McCulloch Co., Galt, Ont.
Rice Lewis & Son, Toronto
Ontario Wind Engine & Pump Co., Toronto
H. W. Petrie, Toronto.
The Smart-Turner Mach. Co., Hamilton

Engines, Steam.

Allis-Chalmers-Bullock, Montreal
Belliss & Marcom, Birmingham, Eng
Canada Machinery Agency, Montreal
The Goldie & McCulloch Co., Galt, Ont.
Rice Lewis & Son, Toronto.
Laurie Engine & Machine Co., Montreal.
Gas & Electric Power Co., Toronto
John McDougall Caledonian Iron Works, Montreal.
Robb Engineering Co., Amherst, N.S.
Sheldons Limited, Galt.
The Smart-Turner Mach. Co., Hamilton
Waterous Engine Works Co., Brantford

Exhaust Heads.

Darling Bros., Ltd., Montreal
Dominion Heating & Ventilating Co., Hespeler
Sheldons Limited, Galt, Ont

Expanded Metal.

Expanded Metal and Fireproofing Co., Toronto

Expanders.

A. B. Jardine & Co., Hespeler, Ont.

Fans, Electric.

Canadian General Electric Co., Toronto.
Canadian Westinghouse Co., Hamilton.
Dominion Heating & Ventlating Co., Hespeler
Gas & Electric Power Co., Toronto
Sheldons Limited, Galt, Ont.
The Smart-Turner Mach. Co., Hamilton.

Fans, Exhaust.

Detroit Foundry Supply Co., Windsor.
Dominion Foundry Supply Co., Montreal
Dominion Heating & Ventilating Co., Hespeler.
Gas & Electric Power Co., Toronto.
Greey, Wm. & J. G., Toronto
Hamilton Facing Mill Co., Hamilton.
Paxson, J. W., Co., Philadelphia
Sheldons Limited, Galt.

Feed Water Heaters.

Darling Bros., Montreal
Laurie Engine & Machine Co., Montreal
John McDougall, Caledonian Iron Works Co., Montreal.
The Smart-Turner Mach. Co., Hamilton

Files and Rasps.

Frothingham & Workman, Ltd., Montreal
John Millen & Son, Ltd., Montreal.
Rice Lewis & Son, Toronto.
Nicholson File Co., Port Hope
H. W. Petrie, Toronto

Fillet, Pattern.

Detroit Foundry Supply Co., Windsor.
Dominion Foundry Supply Co., Montreal
Hamilton Facing Mill Co., Hamilton.

Fire Apparatus.

Waterous Engine Works Co., Brantford.

Fire Brick and Clay.

Detroit Foundry Supply Co., Windsor
Dominion Foundry Supply Co., Montreal
Gilmour, J., New York.
Hamilton Facing Mill Co., Hamilton.
Ontario Lime Association, Toronto
J. W. Paxson Co., Philadelphia.
Toronto Pottery Co., Toronto

Flour Mill Machinery.

Allis-Chalmers-Bullock, Montreal.
Greey, Wm. & J. G., Toronto
The Goldie & McCulloch Co., Galt, Ont.
John McDougal, Caledonian Iron Works Co., Montreal.

Forges.

Canada Foundry Co., Limited, Toronto.
Frothingham & Workman Ltd., Montreal
Hamilton Facing Mill Co., Hamilton.
Independent Pneumatic Tool Co., Chicago, Ill.
H. W. Petrie, Toronto.
Sheldons Limited, Galt, Ont.

Forgings, Drop.

John McDougall, Caledonian Iron Works Co., Montreal.
H. W. Petrie, Toronto.
St. Clair Bros., Galt
Wilson, J. C. & Co., Glenora, Ont.

Forgings, Light & Heavy.

Hamilton Steel & Iron Co., Hamilton

Forging Machinery.

John Bertram & Sons Co., Dundas, Ont.
London Mach. Tool Co., Hamilton, Ont
National Machinery Co., Tiffin, Ohio
Niles-Bement-Pond Co., New York.

Founders.

Greey, Wm. & J. G., Toronto
John McDougall, Caledonian Iron Works Co., Montreal
Niagara Falls Machinery & Foundry Co., Niagara Falls, Ont.
Maxwell, David, & Sons, St. Marys
The Smart-Turner Mach. Co., Hamilton
Wilson, J. C., & Co., Glenora, Ont.

Foundry Coke.

Baird & West, Detroit

Foundry Equipment.

Ph. B. nvillain & E. Ronceray, Philadelphia
Detroit Foundry Supply Co., Windsor
Dominion Foundry Supply Co., Montreal
Gilmour, J., New York

Hamilton Facing Mill Co., Hamilton
Hanna Engineering Works, Chicago
Northern Engineering Works, Detroit
Paxson, J. W., Co., Philadelphia

Foundry Parting.

Doggett, Stanley, New York
Dominion Foundry Supply Co., Montreal
Partomol Co., New York
Foundry Specialty Co., Cincinnati
Stanley Doggett, New York

Foundry Facings.

Detroit Foundry Supply Co., Windsor.
Doggett, Stanley, New York
Dominion Foundry Supply Co., Montreal
Hamilton Facing Mill Co., Hamilton.
J. W. Paxson Co., Philadelphia, Pa.

Friction Clutch Pulleys, etc.

The Goldie & McCulloch Co., Galt.
Greey, Wm. & J. G., Toronto
Link-Belt Co., Philadelphia.

Furnaces.

Detroit Foundry Supply Co., Windsor.
Dominion Foundry Supply Co., Montreal
Hamilton Facing Mill Co., Hamilton.
Northern Engineering Works, Detroit
Paxson, J. W., Co., Philadelphia

Gang Planer Tools.

Armstrong Bros. Tool Co., Chicago

Gas Blowers and Exhausters.

Dominion Heating & Ventilating Co., Hespeler
Sheldons Limited, Galt.

Gas Furnaces.

Chicago Flexible Shaft Co., Chicago

Gas Plants, Suction and Pressure.

Gas & Electric Power Co., Toronto
Williams & Wilson, Montreal

Gauges, Standard.

Cleveland Twist Drill Co., Cleveland
Pratt & Whitney Co., Hartford, Conn.

Gearing.

Greey, Wm. & J. G., Toronto
Wilson, J. C., & Co., Glenora, Ont

Gear Cutting Machinery.

Becker-Brainard Milling Mach. Co., Hyde Park, Mass.
Bickford Drill & Tool Co., Cincinnati.
Dwight Slate Machine Co., Hartford
Greey, Wm. & J. G., Toronto
Kennedy, Wm., & Sons, Owen Sound
London Mach. Tool Co., Hamilton.
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.
Pratt & Whitney Co., Hartford, Conn.
Williams & Wilson, Montreal.
Wilson, J. C., & Co., Glenora, Ont.

Gears, Angle.

Greey, Wm. & J. G., Toronto
Laurie Engine & Machine Co., Montreal.
John McDougall, Caledonian Iron Works Co., Montreal.
Waterous Engine Co., Brantford.
Wilson, J. C., & Co., Glenora, Ont.

Gears, Cut.

Horsburgh & Scott Co., Cleveland
Kennedy, Wm., & Sons, Owen Sound
Wilson, J. C., & Co., Glenora, Ont.

Gears, Iron.

Greey, Wm. & J. G., Toronto
Kennedy, Wm., & Sons, Owen Sound
Wilson, J. C., & Co., Glenora, Ont.

Gears, Mortise.

Greey, Wm. & J. G., Toronto
Kennedy, Wm. & Sons, Owen Sound
Wilson, J. C., & Co., Glenora, Ont

Gears, Rawhide.

Horsburgh & Scott Co., Cleveland

Gears, Reducing.

Brown, David & Sons, Huddersfield, Eng
Greey, Wm. & J. G., Toronto
John McDougall, Caledonian Iron Works Co., Montreal.
Wilson, J. C., & Co., Glenora, Ont.

Gears, Worm.

Horsburgh & Scott Co., Cleveland
Wilson, J. C., & Co., Glenora, Ont

Gears and Pinions.

Wilson, J. C., & Co., Glenora, Ont

Generators, Electric.

Allis-Chalmers-Bullock, Limited, Montreal
Canadian General Electric Co., Toronto
Canadian Westinghouse Co, Hamilton.
Gas & Electric Power Co., Toronto
Hall Engineering Works, Montreal.
H. W. Petrie, Toronto.
Toronto & Hamilton Electric Co. Hamilton.

Governors, Water Wheel.

Wilson, J. C. & Co., Glenora, Ont.

Graphite Paints.

P. D. Dods & Co. Montreal.

Graphite.

Detroit Foundry Supply Co, Windsor.
Doggett, Stanley. New York
Dominion Foundry Supply Co., Montreal
Hamilton Facing Mill Co., Hamilton.
Paxson, J. W., Co, Philadelphia

Grinders, Automatic Knife.

W. H. Banfield & Son, Toronto.

Grinders, Centre.

Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.

Grinders, Cutter.

Becker-Brainard Milling Mach. Co., Hyde Park, Mass.
John Millen & Son, Ltd., Montreal.
Pratt & Whitney Co., Hartford, Conn.

Grinders, Disc.

Armstrong Bros. Tool Co, Chicago

Grinders, Tool.

Armstrong Bros. Tool Co., Chicago.
Blount, J. G., & Co., Everett, Mass.
Gisholt Machine Co Madison, Wis.
H. W. Petrie, Toronto.
Williams & Wilson, Montreal.

Grinding Holders.

Armstrong Bros. Tool Co, Chicago

Grinding Machines.

The Canadian Fairbanks, Montreal.
Independent Pneumatic Tool Co., Chicago. Ill.
Rice Lewis & Son, Toronto.
Niles-Bement-Pond Co., New York.
Paxson J. W., Co. Philadelphia
H. W. Petrie, Toronto.

Grinding & Polishing Machines

Blount, J. G., & Co, Everett Mass.
The Canadian Fairbanks Co., Montreal.
Greey, Wm. & J. G., Toronto
Independent Pneumatic Tool Co. Chicago, Ill.
John Millen & Son Ltd, Montreal.
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.
Standard Bearings, Ltd, Niagara Falls

Grinding Wheels

Carborundum Co. Niagara Falls
Norton Company, Worcester, Mass.

Hack Saws.

Canada Machinery Agency, Montreal.
The Canadian Fairbanks Co., Montreal.
Frothingham & Workman, Ltd Montreal
John Millen & Son, Ltd, Montreal.
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.
Williams & Wilson. Montreal.

Hammers, Drop.

London Mach. Tool Co., Hamilton, Ont
Niles-Bement-Pond Co, New York.

Hammers, Steam.

John Bertram & Sons Co. Dundas, Ont.
London Mach. Tool Co., Hamilton, Ont.
Niles-Bement-Pond Co, New York.

Hand Stocks.

Borden Canadian Co, Toronto

Hangers.

Fay, J. A., & Egan Co., Cincinnati
The Goldie & McCulloch Co., Galt
Greey, Wm. & J. G., Toronto
Kennedy, Wm., & Sons Owen Sound
Owen Sound Iron Works Co., Owen Sound
The Smart-Turner Mach. Co., Hamilton.
Standard Bearings Ltd, Niagara Falls
Waterous Engine Co., Brantford.
Wilson, J. C., & Co. Glenora, Ont.

Heating Apparatus.

Darling Bros., Ltd., Montreal
Dominion Heating & Ventilating Co, Hespeler
Sheldons Limited, Galt.

Hoisting and Conveying Machinery.

Allis-Chalmers-Bullock, Limited, Montreal
Greey, Wm & J. G., Toronto
Niles-Bement-Pond Co., New York.
Northern Engineering Works, Detroit
The Smart-Turner Mach. Co., Hamilton.
Waterous Engine Co., Brantford.
Wilson, J. C., & Co., Glenora, Ont.

Hoists, Electric.

Northern Engineering Works, Detroit

Hoists, Pneumatic.

Canadian Rand Drill Co., Montreal.
Dominion Foundry Supply Co., Montreal
Hamilton Facing Mill Co., Hamilton.
Northern Engineering Works, Detroit

Hoists, Portable & Stationary.

Canadian Piling Co., Montreal

Hose, Air.

Canadian Rand Drill Co., Montreal.
Canadian Westinghouse Co., Hamilton.
Independent Pneumatic Tool Co, Chicago
Paxson, J. W., Co, Philadelphia

Hose Couplings.

Canadian Rand Drill Co., Montreal.
Canadian Westinghouse Co., Hamilton.
Paxson, J. W., Co., Philadelphia

Hose, Steam.

Allis-Chalmers-Bullock, Montreal.
Canadian Rand Drill Co., Montreal.
Canadian Westinghouse Co., Hamilton.
Independent Pneumatic Tool Co., Chicago, Ill.
Paxson, J. W. Co, Philadelphia

Hydraulic Accumulators.

Ph. Bonvillain & E Ronceray, Philadelphia
Niles-Bement-Pond Co, New York.
Perrin, Wm. R, Co. Toronto.
The Smart-Turner Mach. Co., Hamilton.

Hydraulic Machinery.

Allis-Chalmers-Bullock, Montreal
Barber, Chas, & Sons, Meaford
Gas & Electric Power Co. Toronto
Wilson J. C., & Co., Glenora, Ont.

India Oil Stones.

Norton Company, Worcester, Mass.

Indicators, Speed.

L. S. Starrett Co., Athol, Mass.

Injectors.

Canada Foundry Co., Toronto.
The Canadian Fairbanks Co., Montreal.
Desmond-Stephan Mfg. Co., Urbana, Ohio
Frothingham & Workman Ltd., Montreal
Rice Lewis & Son, Toronto.
Penberthy Injector Co., Windsor, Ont.

Iron and Steel.

Frothingham & Workman, Ltd., Montreal

Iron and Steel Bars and Bands.

Hamilton Steel & Iron Co. Hamilton

Iron Cements.

Detroit Foundry Supply Co., Windsor.
Dominion Foundry Supply Co. Montreal
Hamilton Facing Mill Co. Hamilton.
Paxson J. W, Co, Philadelphia

Iron Filler.

Detroit Foundry Supply Co., Windsor.
Dominion Foundry Supply Co. Montreal
Hamilton Facing Mill Co., Hamilton.
Paxson, J. W, Co, Philadelphia,

Jacks.

Frothingham & Workman, Ltd., Montreal
Norton, A. O. Coaticook, Que.

Kegs, Steel Shop.

Cleveland Wire Spring Co, Cleveland

Ladles, Foundry.

Dominion Foundry Supply Co., Montreal
Frothingham & Workman Ltd, Montreal
Northern Engineering Works, Detroit

Lamps, Arc and Incandescent.

Canadian General Electric Co., Toronto.
Canadian Westinghouse Co., Hamilton.
Gas & Electric Power Co., Toronto
The Packard Electric Co., St. Catharines.

Lathe Dogs.

Armstrong Bros. Tool Co., Chicago
Pratt & Whitney Co., Hartford, Conn.

Lathes, Engine.

American Tool Work Co., Cincinnati.
John Bertram & Sons Co., Dundas, Ont.
Canada Machinery Agency, Montreal.
The Canadian Fairbanks Co., Montreal.
London Mach. Tool Co., Hamilton, Ont.
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.
Rice Lewis & Son Toronto
Pratt & Whitney Co., Hartford, Conn.

Lathes, Foot-Power.

American Tool Works Co., Cincinnati.

Lathes, Screw Cutting.

Niles-Bement-Pond Co., New York.

Lathes, Automatic, Screw-Threading.

John Bertram & Sons Co., Dundas, Ont
London Mach. Tool Co., Hamilton, Ont
Pratt & Whitney Co., Hartford, Conn.

Lathes, Bench.

Blount, J. G. & Co. Everett Mass.
London Mach. Tool Co., London, Ont.
Pratt & Whitney Co., Hartford, Conn

Lathes, Speed.

Blount, J. G., & Co, Everett, Mass.

Lathes, Turret.

American Tool Works Co., Cincinnati.
John Bertram & Sons Co., Dundas, Ont.
Blount, J. G. & Co., Everett Mass
Gisholt Machine Co., Madison, Wis.
London Mach. Tool Co., Hamilton, Ont.
Niles-Bement-Pond Co., New York.
The Pratt & Whitney Co., Hartford, Conn.
Warner & Swasey Co., Cleveland O.

Leather Belting.

Canada Machinery Agency, Montreal.
The Canadian Fairbanks Co., Montreal
Greey, Wm. & J. G, Toronto

Locomotives, Air.

Canadian Rand Drill Co., Montreal.

Locomotives, Electrical.

Canadian Westinghouse Co., Hamilton
Gas & Electric Power Co., Toronto
Jeffrey Mfg. Co., Columbus, Ohio.

Locomotives, Steam.

Canada Foundry Co., Toronto.
Canadian Rand Drill Co., Montreal

Locomotive Turntable Tractors.

Canadian Pilling Co., Montreal

Lubricating Plumbago.

Detroit Foundry Supply Co., Detroit.
Dominion Foundry Supply Co., Montreal
Hamilton Facing Mill Co., Hamilton.
Paxson, J. W, Co., Philadelphia

Lubricators, Force Feed.

Sight Feed Oil Pump Co., Milwaukee, Wis

Lumber Dry Kilns.

Dominion Heating & Ventilating Co., Hespeler.
H. W. Petrie. Toronto.
Sheldons Limited, Galt, Ont.

Machinery Dealers.

Canada Machinery Agency, Montreal.
The Canadian Fairbanks Co., Montreal.
Rice Lewis & Son, Toronto
H. W. Petrie, Toronto.
The Smart-Turner Mach. Co., Hamilton.
Williams & Wilson Montreal.

Machinery Designers.

Greey, Wm. & J. G., Toronto
Standard Bearings, Ltd., Niagara Falls.
Wilson, J. C.. & Co., Glenora, Ont

Machinists.

W. H. Banfield & Sons, Toronto.
Greey, Wm. & J. G. Toronto
Hall Engineering Works Montreal.
John McDougall, Caledonian Iron Works Co., Montreal.
Paxson, J. W., Co, Philadelphia
Robb Engineering Co., Amherst. N S.
The Smart-Turner Mach. Co., Hamilton.
Standard Bearing, Ltd Niagara Falls
Waterous Engine Co., Brantford.
Wilson, J. C., & Co., Glenora, Ont.

Machinists' Small Tools.

Armstrong Bros. Tool Co. Chicago.
Butterfield & Co., Rock Island, Que.
Cleveland Twist Drill Co, Cleveland
Frothingham & Workman Ltd., Montreal
Rice Lewis & Son, Montreal.
Pratt & Whitney Co., Hartford, Conn.
Standard Tool Co, Cleveland.
L. S. Starrett Co., Athol, Mass.
Williams & Wilson, Montreal.

Malleable Flask Clamps.

Dominion Foundry Supply Co., Montreal
Paxson, J. W, Co., Philadelphia

Malleable Iron Castings.

Galt Malleable Iron Co., Galt

Mallet, Rawhide and Wood.

Detroit Foundry Supply Co.. Detroit.
Dominion Foundry Supply Co.. Montreal
Paxson, J. W., Co, Philadelphia

Mandrels.

Cleveland Twist Drill Co, Cleveland
A. B. Jardine & Co., Hespeler, Ont.
The Pratt & Whitney Co., Hartford, Conn.
Standard Tool Co., Cleveland.

Maple Cogs, Blank Face.

Wilson J. C., & Co., Glenora Ont.

Maple Cogs, Machine Dressed.

Wilson J. C. & Co., Glenora Ont

Marking Machines.

Dwight Slate Machine Co, Hartford.

Metallic Paints.

P. D Dods & Co., Montreal.

Meters, Electrical.

Canadian Westinghouse Co., Hamilton.
Gas & Electric Power Co., Toronto.

Mill Machinery.

Greey Wm. & J. G., Toronto
The Goldie & McCulloch Co., Galt, Ont.
John McDougall, Caledonian Iron Works Co., Montreal.
H. W. Petrie, Toronto.
Robb Engineering Co., Amherst, N.S.
Waterous Engine Co., Brantford.
Williams & Wilson, Montreal.
Wilson, J. C., & Co., Glenora, Ont.

Milling Attachments.

Becker-Brainard Milling Machine Co. Hyde Park, Mass.
John Bertram & Sons Co., Dundas, Ont.
Cincinnati Milling Machine Co., Cincinnati.
Kearney & Trecker Co., Milwaukee, Wis.
Niles-Bement-Pond Co., New York,
Pratt & Whitney, Hartford, Conn.

Milling Machines, Horizontal.

Becker-Brainard Milling Machinery Co. Hyde Park, Mass.
John Bertram & Sons Co., Dundas, Ont.
London Mach. Tool Co., Hamilton, Ont.
Niles-Bement-Pond Co., New York.
Pratt & Whitney, Hartford, Conn.

Milling Machines, Motor Driven.

Cincinnati Milling Machine Co., Cincinnati

Milling Machines, Plain.

American Tool Works Co., Cincinnati.
Becker-Brainard Milling Machine Co. Hyde Park, Mass.
John Bertram & Sons Co., Dundas, Ont.
Canada Machinery Agency, Montreal
The Canadian Fairbanks Co., Montreal.
Cincinnati Milling Machine Co., Cincinnati
Kearney & Trecker Co., Milwaukee, Wis.
London Mach. Tool Co., Hamilton, Ont.
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.
Pratt & Whitney Co., Hartford, Conn.
Williams & Wilson, Montreal.

Milling Machines, Universal.

American Tool Works Co., Cincinnati.
Becker-Brainard Milling Machine Co., Hyde Park, Mass.
John Bertram & Sons Co., Dundas, Ont.
Canada Machinery Agency, Montreal.
The Canadian Fairbanks Co., Montreal.
Cincinnati Milling Machine Co., Cincinnati
Kearney & Trecker Co., Milwaukee, Wis.
London Mach. Tool Co., Hamilton, Ont
Niles-Bement-Pond Co., New York.
H. W Petrie, Toronto.
Williams & Wilson, Montreal.

Milling Machines, Vertical.

Becker-Brainard Milling Machine Co., Hyde Park, Mass.
John Bertram & Sons Co., Dundas, Ont.
Kearney & Trecker Co.. Milwaukee Wis
Canada Machinery Agency. Montreal.
London Mach. Tool Co., Hamilton, Ont.
Niles-Bement-Pond Co., New York.

Milling Tools.

Wm. Abbott, Montreal.
Becker-Brainard Milling Machine Co., Hyde Park, Mass
Geometric Tool Co., New Haven, Conn.
Hamilton Tool Co., Hamilton, Ont.
London Mach. Tool Co, Hamilton, Ont.
Pratt & Whitney Co., Hartford, Conn.
Standard Tool Co., Cleveland.
Standard Bearings, Ltd., Niagara Falls

Mine Cars and Hitchings.

Cumming, J. W., New Glasgow N.S.

Miners' Copper Needles and Stemmers.

Cumming. J. W., New Glasgow N.S.

Mining Machinery.

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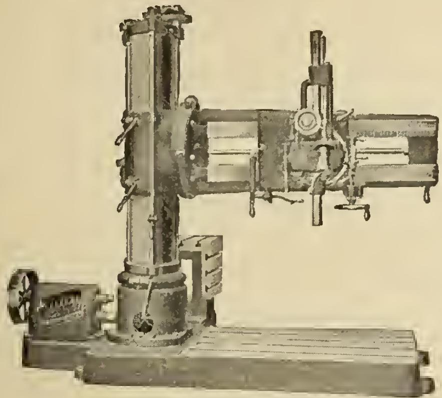
Canadian Rand Drill Co., Montreal
Gas & Electric Power Co., Toronto.
Jeffrey Mfg. Co., Columbus, Ohio.
Laurie Engine & Machine Co., Montreal.
Rice Lewis & Son, Toronto.
John McDougall, Caledonian Iron Works Co., Montreal.
T. & H. Electric Co. Hamilton.



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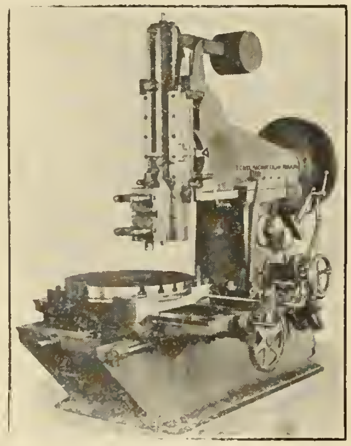

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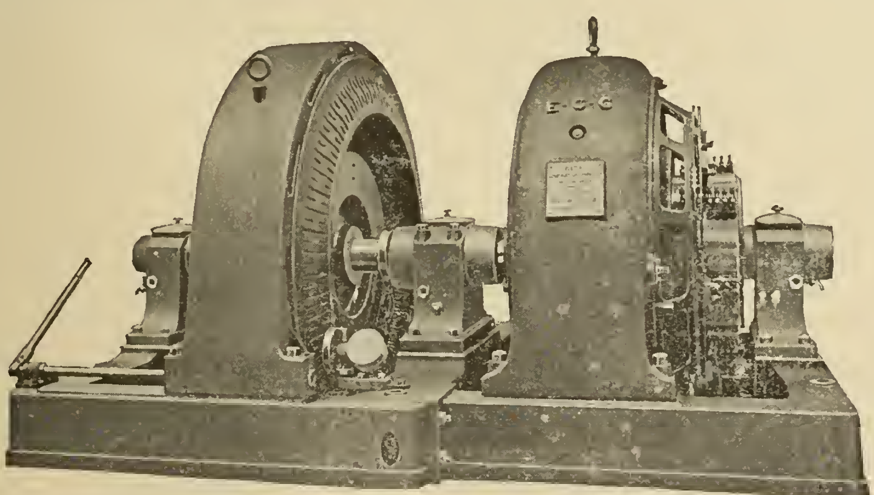

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Consolidated Electric Co., Toronto
Electrical Machinery Co., Toronto.
Gas & Electric Power Co., Toronto
Hall Engineering Works, Montreal.
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T. & H. Electric Co., Hamilton.

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Canadian Rand Drill Co., Montreal.

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Dominion Foundry Supply Co., Montreal
Hamilton Facing Mill Co., Hamilton
Paxson J. W., Co., Philadelphia

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Dominion Foundry Supply Co., Montreal
Hamilton Facing Mill Co., Hamilton.
Paxson, J. W., Co., Philadelphia

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National Machinery Co., Tiffin, Ohio.

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The Goldie & McCulloch Co., Galt

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Sight Feed Oil Pump Co., Milwaukee, Wis.

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Paxson, J. W., Co., Philadelphia

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Cleveland Wire Spring Co., Cleveland
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Hamilton Steel & Iron Co., Hamilton

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Canada Machinery Agency, Montreal.
Curtis & Curtis Co., Bridgeport, Conn.
Frothingham & Workman, Ltd., Montreal
Hart Mfg. Co., Cleveland
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London Mach. Tool Co., Hamilton, Ont.
Niles-Bement-Pond Co., New York.
Shantz, I. E., & Co., Berlin, Ont.

Pipe, Municipal.

Canadian Pipe Co., Vancouver, B.C.
Pacific Coast Pipe Co., Vancouver, B.C.

Pipe, Waterworks.

Canadian Pipe Co., Vancouver, B.C.

Planer Jacks.

Armstrong Bros. Tool Co., Chicago

Planers, Standard.

American Tool Works, Cincinnati.
Bateman's Machine Tool Co., Leeds, Eng.
John Bertram & Sons Co., Dundas, Ont.
Canada Machinery Agency, Montreal.
The Canadian Fairbanks Co., Montreal.
Rice Lewis & Son, Toronto.
London Mach. Tool Co., Hamilton, Ont.
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.
Pratt & Whitney Co., Hartford, Conn.
Williams & Wilson, Montreal.

Planers, Rotary.

John Bertram & Sons Co., Dundas, Ont.
London Mach. Tool Co., Hamilton, Ont.
Niles-Bement-Pond Co., New York.

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Doggett, Stanley, New York
Dominion Foundry Supply Co., Montreal
Hamilton Facing Mill Co., Hamilton,
J. W. Paxson Co., Philadelphia, Pa.

Pneumatic Tools.

Allis-Chalmers-Bullock, Montreal.
Canadian Rand Drill Co., Montreal.
Hamilton Facing Mill Co., Hamilton.
Hanna Engineering Works, Chicago.
Independent Pneumatic Tool Co. Chicago, New York
Paxson, J. W., Co., Philadelphia

Power Hack Saw Machines.

Frothingham & Workman, Ltd., Montreal

Power Plants.

Gas & Electric Power Co., Toronto
John McDougall Caledonian Iron Works Co., Montreal.
The Smart-Turner Mach. Co., Hamilton

Power Plant Equipments.

Darling Bros., Ltd., Montreal
Gas & Electric Power Co., Toronto

Presses, Drop.

W. H. Banfield & Son, Toronto.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs Co., Hamilton
Canada Machinery Agency, Montreal
Ferracute Machine Co., Bridgeton, N.J.
Laurie Engine & Machine Co., Montreal
Niles-Bement-Pond Co., New York

Presses, Hand.

E. W. Bliss Co., Brooklyn, N.Y.
Brown Boggs Co., Hamilton
Ferracute Machine Co., Bridgeton, N.J.

Presses, Hydraulic.

John Bertram & Sons Co., Dundas, Ont.
Laurie Engine & Machine Co., Montreal.
London Mach. Tool Co., Hamilton, Ont
John McDougall Caledonian Iron Works Co., Montreal.
Niles-Bement-Pond Co., New York.
Perrin, Wm. R., & Co., Toronto

Presses, Power.

E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs Co., Hamilton
Canada Machinery Agency, Montreal.
Ferracute Machine Co., Bridgeton, N.J.
Laurie Engine & Machine Co., Montreal
London Mach. Tool Co., Hamilton, Ont.
John McDougall Caledonian Iron Works Co., Montreal.
Niles-Bement-Pond Co., New York.

Presses Power Screw.

Brown, Boggs Co., Hamilton
Ferracute Machine Co., Bridgeton, N.J.
Perrin, Wm. R., & Co., Toronto

Pressure Regulators.

Darling Bros., Ltd., Montreal

Producer Plants.

Canada Foundry Co., Toronto

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Greey, Wm. & J. G., Toronto
Jeffrey Mfg. Co., Columbus, Ohio.
Laurie Engine & Machine Co., Montreal.
John McDougall Caledonian Iron Works Co., Montreal.
Waterous Engine Works Co., Brantford

Pulleys.

Canada Machinery Agency, Montreal.
The Canadian Fairbanks Co., Montreal.
Fay, J. A., & Egan Co., Cincinnati
The Goldie & McCulloch Co., Galt.
Greey, Wm. & J. G., Toronto
Laurie Engine & Machine Co., Montreal.
John McDougall Caledonian Iron Works Co., Montreal.
Owen Sound Iron Works Co., Owen Sound
H. W. Petrie, Toronto.
The Smart-Turner Mach. Co., Hamilton.
Standard Bearings Ltd., Niagara Falls,
Waterous Engine Co., Brantford.
Williams & Wilson, Montreal.
Wilson, J. C., & Co. Glenora, Ont.

Pumps.

Laurie Engine & Machine Co., Montreal
Ontario Wind Engine & Pump Co., Toronto

Pump Governors.

Darling Bros., Ltd. Montreal

Pumps, Hydraulic.

Ph. Bonvillain & E. Ronceray, Philadelphia
Laurie Engine & Machine Co., Montreal
Perrin, Wm. R. & Co., Toronto

Pumps, Oil.

Sight Feed Oil Pump Co. Milwaukee, Wis.

Pumps, Steam.

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Canada Foundry Co., Toronto.
Canada Machinery Agency, Montreal.
Darling Bros., Ltd., Montreal
Gas & Electric Power Co., Toronto
The Goldie & McCulloch Co., Galt.
John McDougall Caledonian Iron Works, Montreal.
H. W. Petrie, Toronto.
The Smart-Turner Mach. Co., Hamilton.
Standard Bearings, Ltd., Niagara Falls,
Waterous Engine Co. Brantford

Pumping Machinery.

Canada Foundry Co., Limited, Toronto
Canada Machinery Agency, Montreal.
Canadian Rand Drill Co., Montreal.
Darling Bros., Ltd., Montreal
Gas & Electric Power Co., Toronto.
Hall Engineering Works, Montreal, Que.
Laurie Engine & Machine Co., Montreal.
London Mach. Tool Co., Hamilton, Ont.
John McDougall Caledonian Iron Works Co., Montreal
The Smart-Turner Mach. Co., Hamilton
Standard Bearings, Ltd., Niagara Falls,

Punches and Dies.

W. H. Banfield & Sons, Toronto.
Bliss, E. W., Co., Brooklyn, N.Y.
Butterfield & Co., Rock Island.
Ferracute Machine Co., Bridgeton, N.J.
Globe Machine & Stamping Co.
A. B. Jardine & Co., Hespeler, Ont.
London Mach. Tool Co., Hamilton, Ont
Pratt & Whitney Co., Hartford, Conn.
H. W. Petrie, Toronto.
Standard Bearings, Ltd., Niagara Falls,

Punches, Power.

John Bertram & Sons Co., Dundas, Ont.
E. W. Bliss Co., Brooklyn, N.Y.
Canada Machinery Agency, Montreal.
Ferracute Machine Co. Bridgeton, N.J.
London Mach. Tool Co., Hamilton, Ont
Niles-Bement-Pond Co., New York.

Punches, Pneumatic.

Allen, John F., New York

Punches, Turret.

London Mach. Tool Co., London, Ont

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John Bertram & Sons Co., Dundas, Ont.
London Mach. Tool Co., Hamilton, Ont
Niles-Bement-Pond Co., New York

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John Bertram & Sons Co., Dundas, Ont.
London Mach. Tool Co., Hamilton, Ont.

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Hamilton Facing Mill Co., Hamilton.
Paxson, J. W., Co., Philadelphia

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Hamilton Facing Mill Co., Hamilton
Paxson, J. W., Co., Philadelphia

Raw Hide Pinions.

Brown, David & Sons Huddersfield, Eng.
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Butterfield & Co., Rock Island
Cleveland Twist Drill Co., Cleveland
Frothingham & Workman Ltd., Montreal
Hamilton Tool Co., Hamilton
Hanna Engineering Works Chicago
A. B. Jardine & Co., Hespeler, Ont.
Morse Twist Drill and Machine Co., New Bedford, Mass.
Pratt & Whitney Co., Hartford, Conn.
Standard Tool Co., Cleveland.

Reamers, Steel Taper.

Butterfield & Co., Rock Island.
A. B. Jardine & Co., Hespeler, Ont.
John Millen & Son Ltd., Montreal.
Pratt & Whitney Co., Hartford, Conn.
Standard Tool Co., Cleveland.

Reamers, Adjustable.

Lapointe Machine Tool Co., Hudson, Mass.
Pratt & Whitney Co., Hartford, Conn.

Rheostats.

Canadian General Electric Co., Toronto.
Canadian Westinghouse Co., Hamilton
Gas & Electric Power Co., Toronto.
Hall Engineering Works Montreal, Que.
T. & H. Electric Co., Hamilton,

Riddles.

Buffalo Foundry Supply Co., Buffalo
Detroit Foundry Supply Co., Windsor
Hamilton Facing Mill Co., Hamilton.
Dominion Foundry Supply Co., Montreal
J. W. Paxson Co., Philadelphia, Pa.

Riveting Machines.

Allen, John F., New York

Riveting Machines, Hydraulic.

Allen, John F., New York

Riveting Machines, Pneumatic.

Allen, John F., New York

Riveters, Pneumatic.

Allen, John F., New York
Hanna Engineering Works, Chicago.
Independent Pneumatic Tool Co., Chicago, Ill.

Rolls, Bending.

John Bertram & Sons Co., Dundas, Ont.
London Mach. Tool Co., Hamilton, Ont.
Niles-Bement-Pond Co., New York.

Rolls, Chilled Iron.

Greey, Wm. & J. G., Toronto

Rolls, Sand Cast.

Greey, Wm. & J. G., Toronto

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Canadian Westinghouse Co., Hamilton
Paxson, J. W., Co. Philadelphia
Toronto and Hamilton Electric Co., Hamilton.

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Norton Co., Worcester, Mass.

Safes.

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Canadian Rand Drill Co., Montreal
Detroit Foundry Supply Co., Windsor
Dominion Foundry Supply Co., Montreal
Hamilton Facing Mill Co., Hamilton.
J. W. Paxson Co., Philadelphia, Pa.

Sand, Heavy, Grey Iron.

Detroit Foundry Supply Co., Windsor
Dominion Foundry Supply Co., Montreal
Hamilton Facing Mill Co., Hamilton.
Paxson, J. W., Co., Philadelphia

Sand, Malleable.

Detroit Foundry Supply Co., Windsor
Dominion Foundry Supply Co., Montreal
Hamilton Facing Mill Co., Hamilton
Paxson, J. W., Co., Philadelphia

Sand, Medium Grey Iron.

Detroit Foundry Supply Co., Windsor
Dominion Foundry Supply Co., Montreal
Hamilton Facing Mill Co., Hamilton
Paxson, J. W. Co., Philadelphia

Sand Sifters.

Detroit Foundry Supply Co., Windsor
Dominion Foundry Supply Co., Montreal
Hamilton Facing Mill Co., Hamilton
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* * *

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Goldie & McCulloch Co., Galt.
Greey, Wm. & J. G., Toronto
Owen Sound Iron Works Co., Owen Sound
H. W. Petrie, Toronto.
Robb Engineering Co. Amherst, Ont.
Standard Bearings, Ltd., Niagara Falls
Waterous Engine Works, Brantford
Williams & Wilson Montreal.
Wilson, J. C., & Co., Glenora, Ont.

Sawing Machines, Metal.

Niles-Bement-Pond Co. New York.
Paxson, J. W., Co., Philadelphia

Saws, Hack.

Canada Machinery Agency, Montreal.
Detroit Foundry Supply Co., Windsor
Frothingham & Workman, Ltd., Montreal
London Mach. Tool Co., Hamilton
Rice Lewis & Son, Toronto.
John Millen & Son, Ltd., Montreal.
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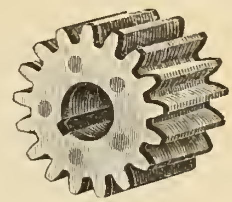

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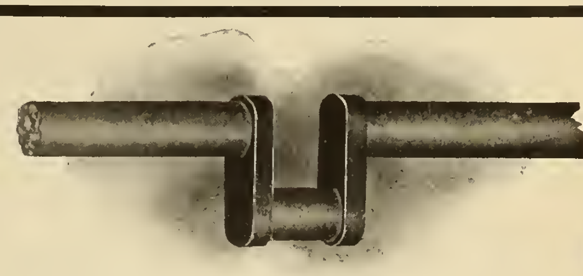

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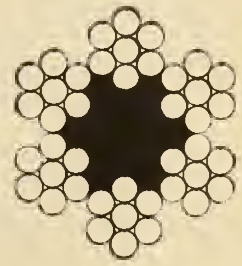

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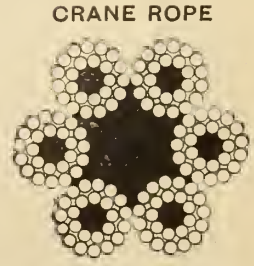

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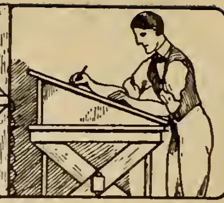

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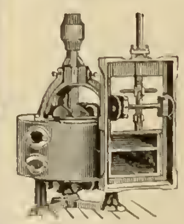

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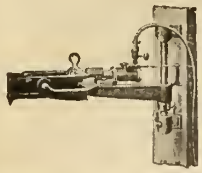

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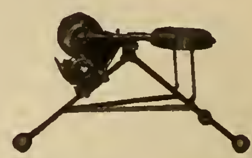

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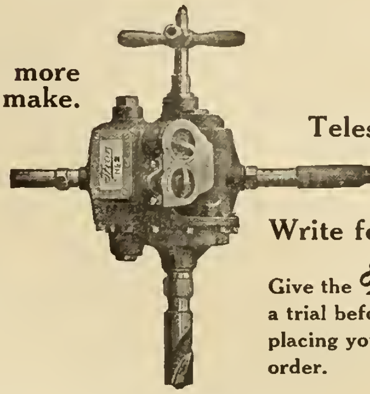

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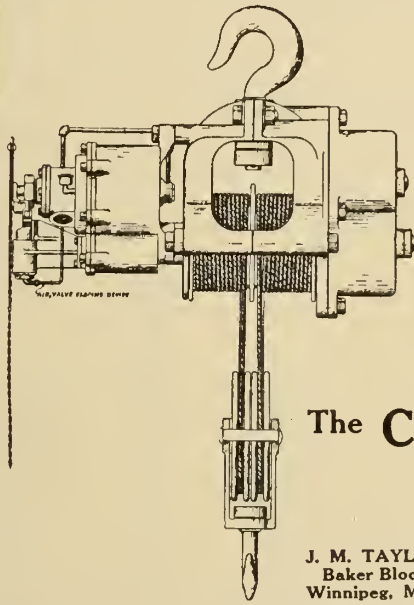

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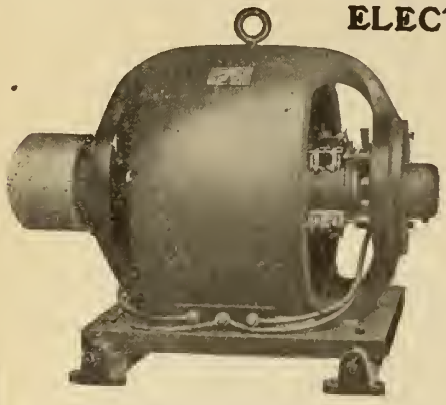

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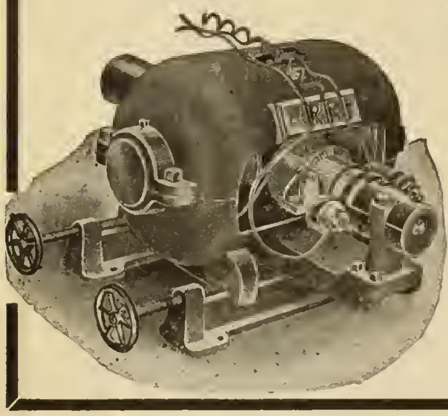

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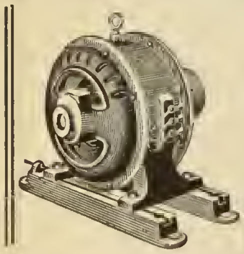

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Crab runs on top of two parabolic bridge girders.

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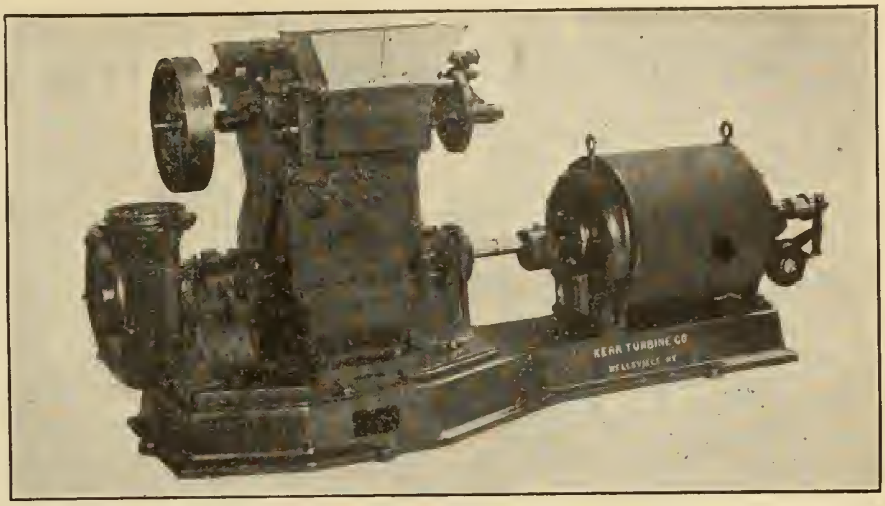

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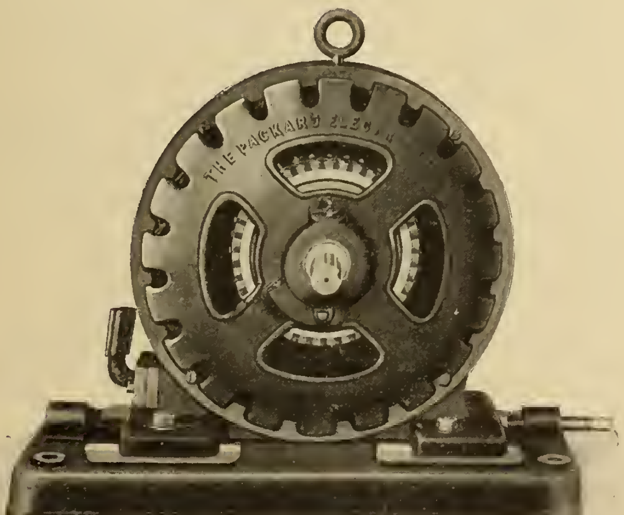

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High Efficiency and Power Factor.

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Vol. IV. FEBRUARY, 1908 No. 2

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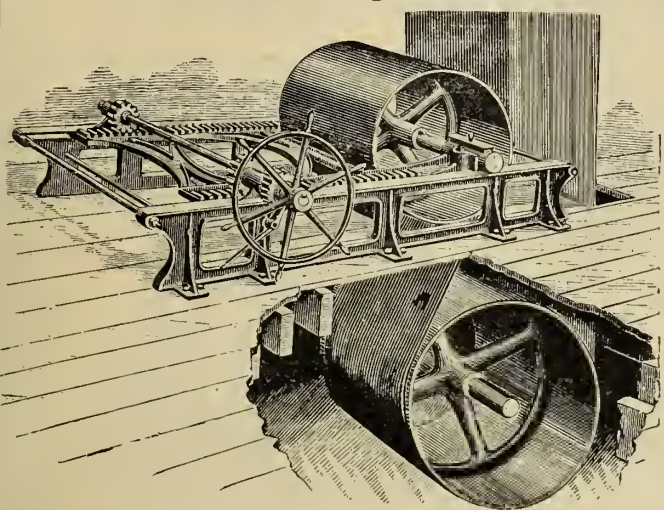

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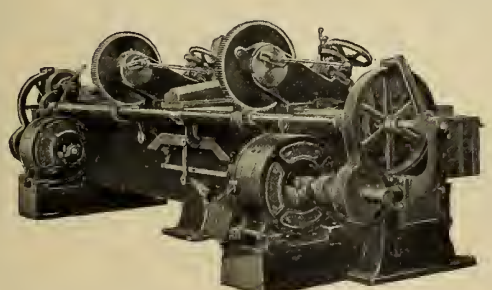

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One new 28″ x 16′ New Haven.
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One new 32″ x 16′ New Haven (triple geared.)
One new 36″ x 16′ Improved London.
One new 32″ x 18′ Improved London.
One new 16″ x 6′ Rahn, Carpenter.
Two new 16″ x 8′ Lodge and Shipley (patent head)
One nearly new 25″ 14′ Sarnia.
One new 17″ x 8′ Greaves, Klusman.
One new 19″ x 10′ Greaves, Klusman.
One 18″ x 8′ London.
One 16″ x 6′ Gardner.
One nearly new 9″ x 25″ Barnes.
One new 14″ x 6′ Sebastian.
One new 15″ x 6′ Sebastian.
One new 15″ x 8′ Sebastian.
One nearly new 13″ x 6′ Star.
One 12″ x 6′ Dundas.
One new 18″ x 8′ Rahn, Carpenter.
One new 22″ x 12′ Lodge & Shipley.
One new 16″ x 10′ Rahn, Carpenter.
One rebuilt 23″ x 10″ complete.
One 30″ x 15′ 6″, in good order.
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One 9″ 52″ Sebastian, foot power.
One 24″ x 40″ x 12′ London gap.
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One 12″ x 24″ x 5′ Dundas gap.
One new 18″ x 25″ x 12′ Rahn, Carpenter gap.
One 11″ x 48″ Pitman Speed Lathe.

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Four new 20″ B. G. Mechanics.
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One new 16″ Steptoe.
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Planers are generally judged by their maximum speeds. This method is misleading because it ignores the great loss of time at reversal. The best method is to find the earning capacity or **average** speed, by taking the time required to make 5 or 10 "cycles" of cut and return, thus:— Length of stroke × 2 × number of cycles × 60 ÷ time occupied (in seconds) = average speed in feet per minute.

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cutting at the same speed, only takes 237 seconds. In £ s. d. this is £25 per annum in favor of the **BATEMAN**, reckoned at 1s. 3d. per hour. This is largely due to the latter's promptness in reversing. But, besides this, the **BATEMAN** will cut at 80 ft. when required and then earns £125, or 100 per cent. more than a speed-up old type machine.

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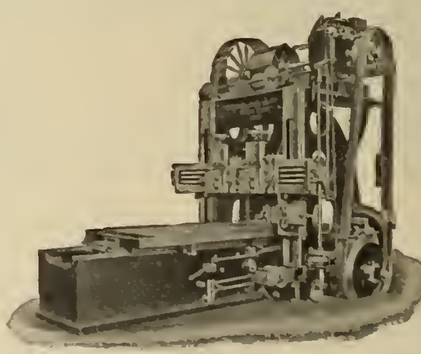

4 ft. x 4 ft. x 12 ft. Bateman Topspeed Planer building to stock, 3 tools, belt drive. Cut speed 20 to 80 ft., return speed 150 ft. per min. Code word "ISAPAVE."

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105¼ MINUTES.

MILLING
51¼ MINUTES.

No. 4 Plain
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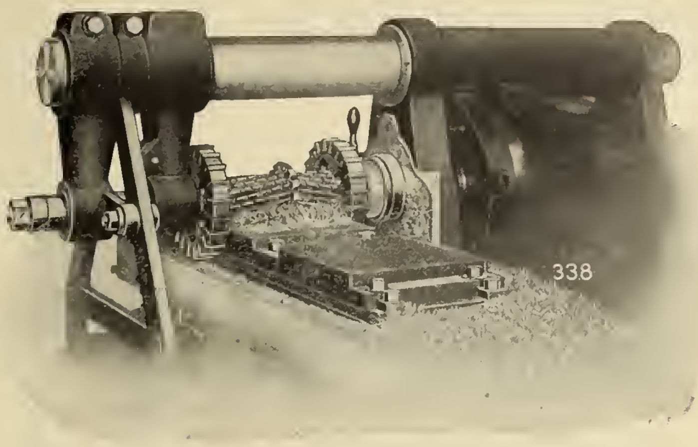

These are grey iron castings, 10 1-4 in. wide 14 in. long. The operation shown takes a cut 3-16 in. deep across the top surface and the two edges, and also cuts the 5-8 x 1 in. slot from the solid with cutters 8 in., 3 1-2 in. and 5 3-4 in. diameter, all at one time, at a table travel of 4.2 in. per minute. The time of this operation, including chucking, is 15.6 minutes. The average time for milling one piece complete is 51 1-2 minutes. Former planing time, 105 1-4 minutes.

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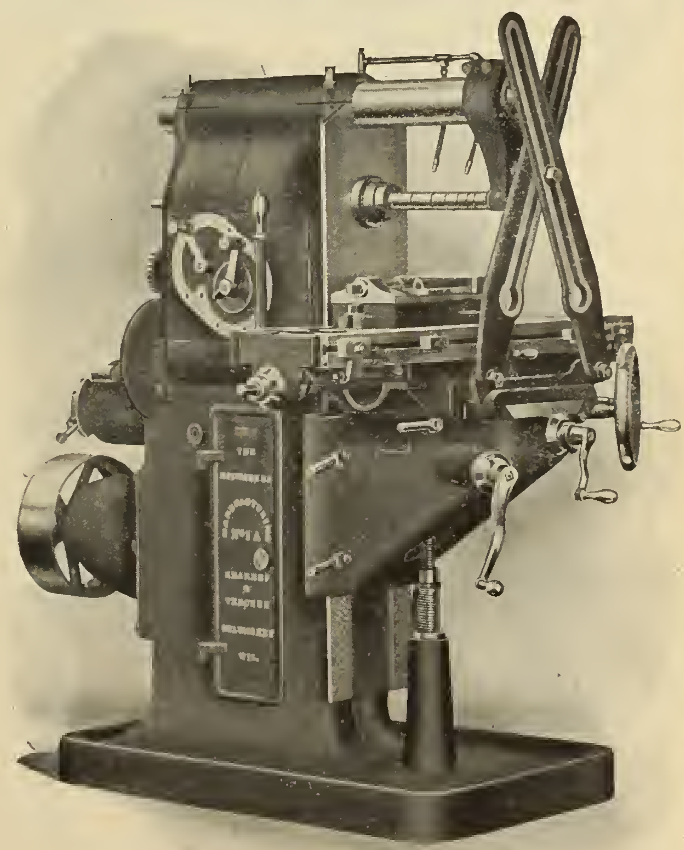

The Miller that will take a trifle heavier cut, stand a little faster feed, or adjust more conveniently, so that the operator gets his result a little quicker, is the one that pays by diminishing costs. Maybe it is because the "Milwaukee" accomplishes a little more in this direction that we are able, even now, to sell them faster than we can turn them out. Users who try them out are not often satisfied with one machine; they want their whole Miller equipment equally good.

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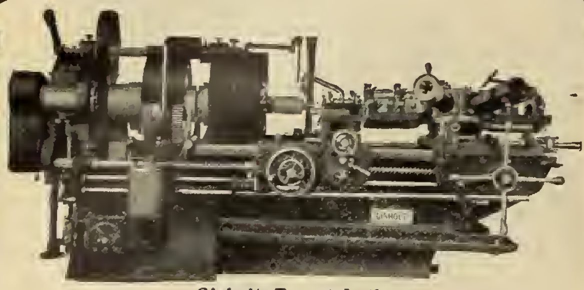

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GISHOLT LATHES

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Gisholt Boring Mills are built in six sizes, from 30 in. to 72 in., and are equipped with the most improved devices for time and labor saving.

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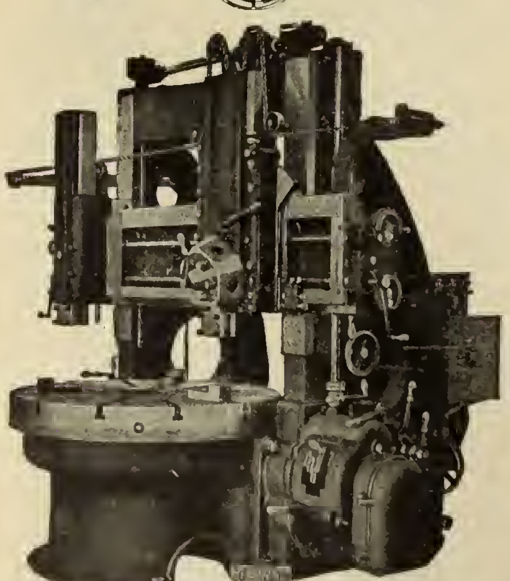

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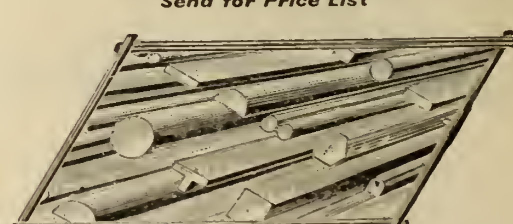

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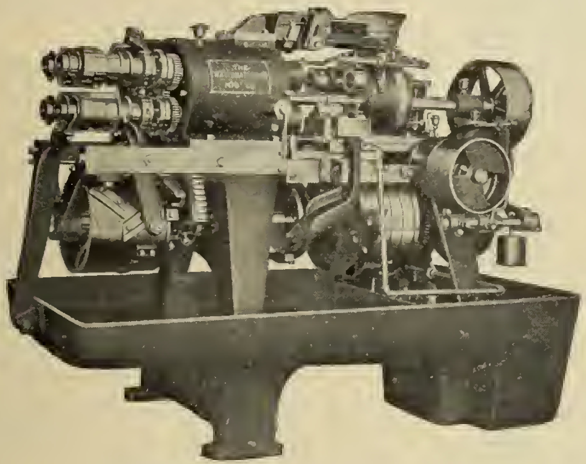

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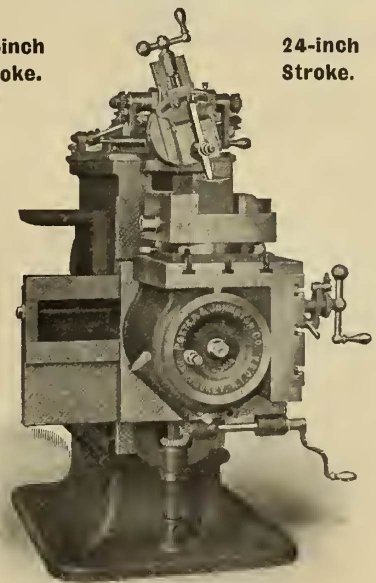

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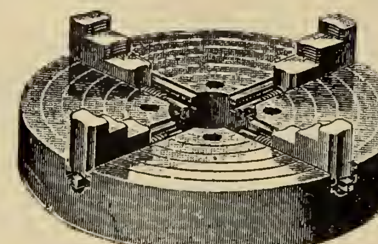

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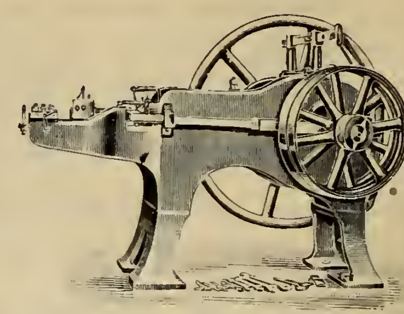

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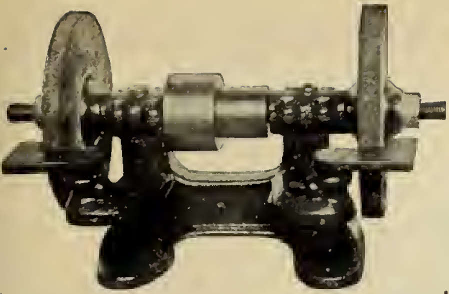

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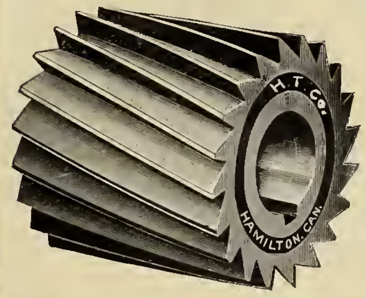

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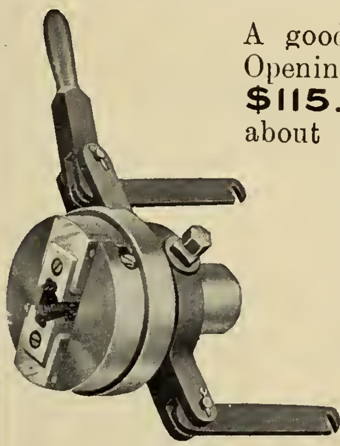

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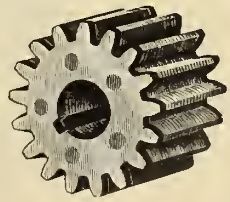

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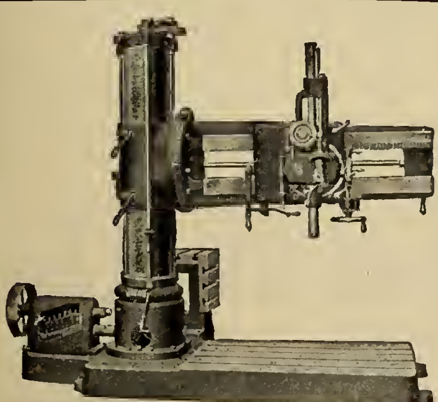

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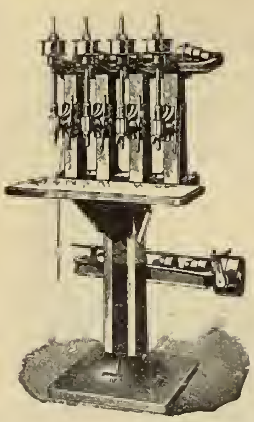

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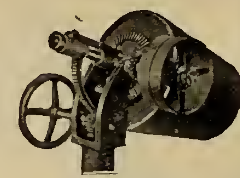

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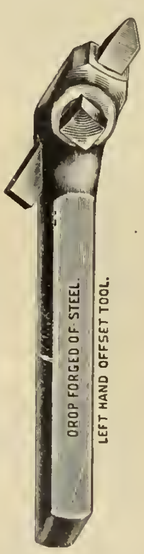

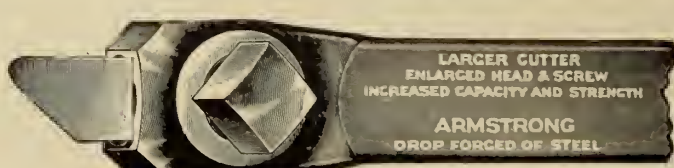

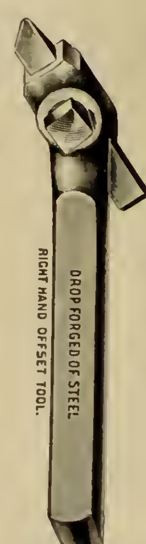

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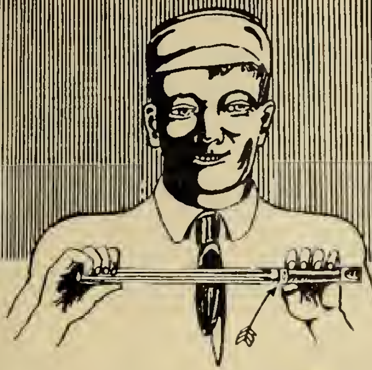

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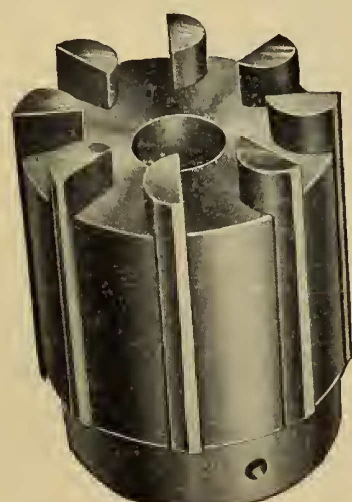

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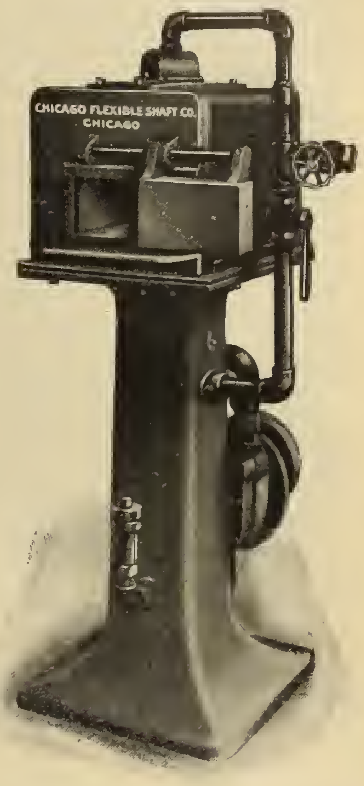

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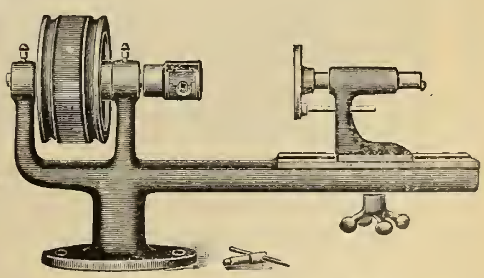

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Deep Hole Chucking; Difficulties and Overcoming of Them

Taking Up Also the Considerations Which Have a Bearing on the Operation, and Illustrating the Drills and Jigs Necessary to the Operation.

By JOHN EDGAR

The forcing of a hole through a long piece of steel so that it may be true and straight was quite a task with the old methods, and even now, with the modern methods of chucking, the job is one that requires considerable skill and cannot be rushed without risk of poor results.

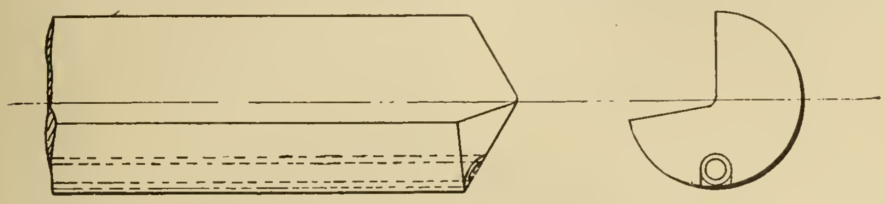


Fig. 1.—Single Lip Straight Way Drill.

Producing Long Holes in Odd Jobs.

Up to the line of the hollow spindles in the lathe and milling machines very little of this kind of work was done except in the manufacture of guns and rifles. When a machine designer did impose on the good nature of the shop by designing work that required deep hole chucking, the latter managed to overcome the difficulties involved by using the flat drill which, when handled with care and by skilled hands, produced a hole of a very high degree of truth. But the time consumed by such a process was great as compared with the other work on the piece.

A small hole was drilled by the means of a flat drill and then enlarged to size by using a half-round drill, which would straighten up the hole and the results were considered satisfactory.

But when the hollow spindle was made a feature in the regular construction of machine tools some better methods were necessary to the successful manufacture of this new feature. It was, of course, natural for the machine tool manufacturer to go where such work was carried on successfully for ideas, and it was to the gun manufacturer that he went and reaped the benefit of the latter's experience.

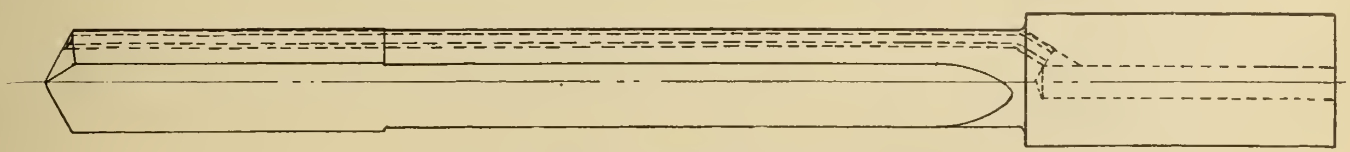


Fig. 2.—Showing Oil Tubes.

Time the Chief Consideration in Boring the Hole in Lathe Spindle.

The bore of a shoulder arm is probably the finest piece of work that is produced in this line. It must be straight and true, and while the barrel is straightened to some extent after the hole is produced, the latter must be straight to a much finer degree of accuracy than is required in the manufacture of the hollow spindle of the modern machine tool.

While accuracy is a large item in the production of the through hole, time and cost of production are of much greater importance. The hole through a spindle of either the lathe or milling machine is a clearance hole and is used either to allow of bar stock being used and machined on one end, or in the latter case to allow of the use of a draw bar to hold the cutter or arbor in place in the taper hole in the front end of the spindle.

A hole in either case that does not run out of true more than a thirty-second of an inch is well within the limits of any requirement. That such a hole can be produced by following old time methods we fully acknowledge, but that the time consumed is beyond manufacturing practicability is the point on which we base the argument.

Some method must be used whereby we may produce a hole, true within the limits above mentioned and at a price somewhere within the range of modern cost per operation. When we look at the modern machine tool we see a machine that, judged by old standards, would be beyond the reach of those who to-day are enjoying increased production by its use. But when we realize

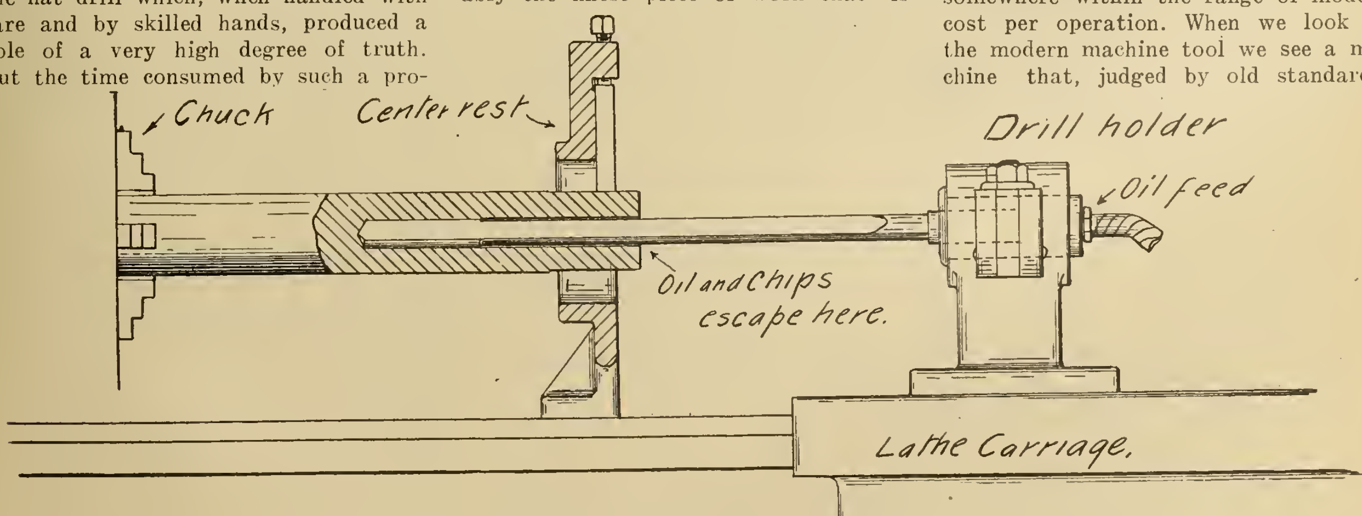


Fig. 3.—Method of Using Straight Way Tool.

that these improved machines are used in producing those of their like, we see how it is possible for us to-day to get so much value for our money.

So in the case of the hollow spindle, we have a feature that judged by the old standards would be a thing impossible to include at present day prices.

As mentioned above, the experience of the gun manufacturer was relied upon in getting a proper start in this direction.

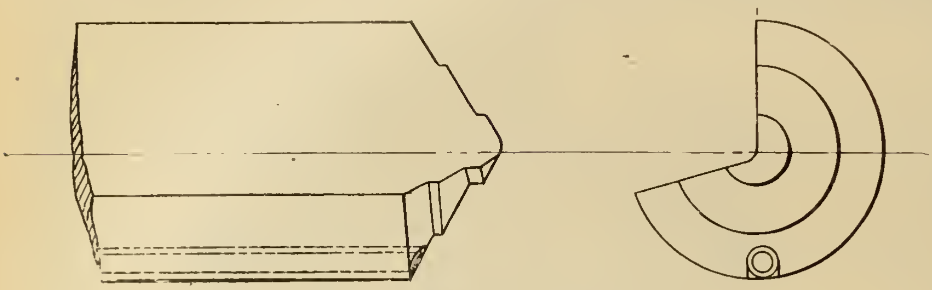


Fig. 4.—Steped Round Drill.

The manufacturer of shoulder arms has developed a specialized plant for the production of these deep holes. The hole must be straight and true in order to be fit for the use it is intended for and to meet competition the cost of producing the hole must be as small as possible.

The machine tool manufacturer is, in producing these long holes, surrounded by similar circumstances, but accuracy is not of so much importance as is the reduced cost of production.

Difficulties Met in Producing Holes.

One of the difficulties encountered in the use of the flat drill in producing these deep holes, is the clogging of the chips. This clogging causes frequent breakage and necessitates the removal of the drill from the hole at frequent intervals and is the cause of much waste of time.

The difficulty with which lubricant was introduced at the point of the drill was another source of trouble and necessary caution reduced the speed with which the drill could be fed into the material.

These difficulties have all been overcome in the modern methods now in use and the results are all that one could wish. The lubricant is now introduced at the drill point under pressure and in such a manner that while lubricating and keeping the cutting edges cool, it forces out the chips, and thus prevents the clogging.

There are several methods in vogue at present, each of which has features commendable for certain classes of work. Both twist and straightway drills are used. The former are mostly of the two-lip form and the latter in both single and two-lip varieties.

Fig. 1 shows a single-lip drill point. The groove is formed by removing a little more than one-quarter of the section, the cutting edge being radial and the other somewhat below the centre so that the cutting edge may run to the centre and past it. The section removed may vary from 95 degrees to 110 degrees of the whole section, allowing plenty chip room and still not weakening the drill so as to allow it to give under tensional strains to any large extent.

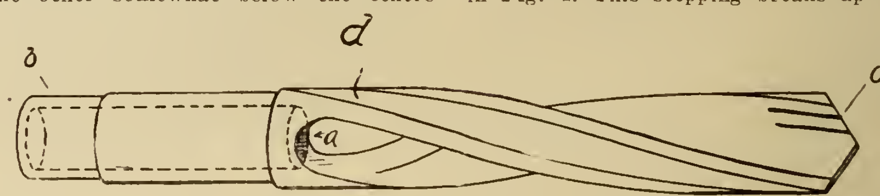


Fig. 6.—Twist Drill for Deep Hole Chucking.

Fig. 2 shows the full length drill and gives an idea as to the provisions made for introducing the oil. The tube is let into the groove milled along the length of the drill opposite the cutting lip and at the shank the end of the tube is introduced into the hole drilled from the outside to intersect the central hole drilled in the shank. The tube is staked in and soldered.

Fig. 3 shows the manner in which this drill is used. Shown here is a special lathe used for this class of work having instead of the ordinary cross slide and tool rest a special holder for the drill fastened to the carriage. The drill is clamped in a bushing in this holder, the hole in which lines with the axis of the spindle. Connected to the bushing is a flexible oil tube through which oil is fed to the drill point by means of the tube in the drill. By this means a fresh supply of coal oil is continually being fed to the cutting point and on its way to the mouth of the drilled hole in the work carries the chips along, keeping the hole free.

The work is chucked and supported in the centre rest as is usually done in this class of work.

A speed of from 10 to 30 inches per hour may be obtained in this manner, depending on the quality of the material in the work, and the steel used in the drill. A high speed drill may be forced to twenty-three inches an hour, drilling a $\frac{3}{4}$-inch hole in crucible steel spindles.

For drills over $\frac{3}{4}$ inches in diameter the cutting lip may be stepped as shown in Fig. 4. This stepping breaks up the chips and reduces the tensional strain on the drill.

For large holes, such as those in lathe spindles a two-lip drill may be used after a small hole has been first drilled through to enlarge the hole to the desired size. Such a drill is shown at Fig. 5. The principle is the same as the single-lip drill.

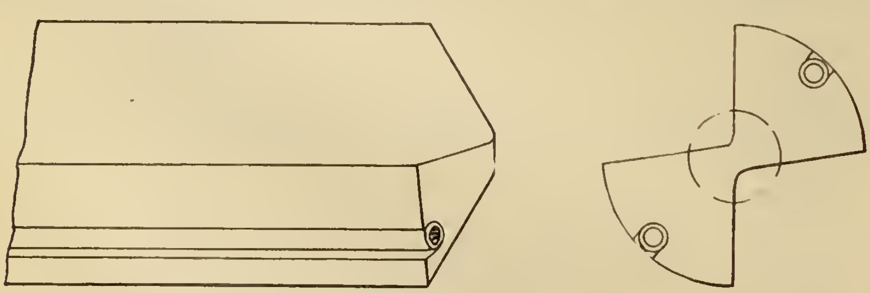


Fig. 5.—Two-Lipped Drill.

High Sneed Drills for This Work.

The use of the high speed steels in drills of this class, when made wholly of such steel, bring the cost up to a high figure and the waste material in shank and stem will cause many to defer using it because of its high cost. Some tool makers make the end of high speed steel and fasten it to the stem in one of many ways. Thus in Fig. 2 the drill would be made of two pieces separated at (a), a splice joint being made to join them together. On the larger size drills a blade of high speed steel may be inserted in the cutting lip by a screwed joint using but a very small piece of high speed steel, the shank and stem being made of a hard crucible steel. The drill shown in Fig. 5 may be made with high speed steel lip with ease on account of its size.

High speed steel for this work has the advantage of being run at a much higher speed and of allowing a faster feed, and in this way much better time can be made. This quality of steel also allows the drill to be used longer without grinding, thus increasing the life of the drill.

Special Twist Drill for This Work.

A twist drill especially designed for this class of work is shown in Fig. 6. This drill is like the ordinary twist drill in many respects, with these exceptions. It is made with a hollow shank, the hole running out into the flutes at (a). The outside is grooved at (d). The shank is made with a shoulder at (e), to which is fastened a long tube, the point generally being a threaded one, the outside of the tube being smaller than the diameter of the drill.

This drill is used as shown in Fig. 7. The work is chucked and supported by the centre rest as shown. The centre support is set somewhat from the free end of the work. The machine on which this is used is similar to that shown in Fig. 3. A hole is first drilled in the end of the work to a depth equal to the length of the body of the hollow shank drill. This is to start the drill. This hole is drilled with an ordinary twist drill, the size required, held in the holder on the carriage. After this hole is drilled the starting drill is removed, and the support A is clamped into place. Before doing this the end of the work must be turned down to fit the gland box (a) and the drill inserted in the support. After the support is clamped in place the oil pipe is connected up and the drill stem clamped in the holder on the carriage, from which it receives its feeding motion. The gland boxes on either end of the support prevent the oil from escaping when properly adjusted, and the pressure of the oil forces it along the outside of the drill along the grooves (d), Fig. 6, to the cutting joints, where it lubricates and cools the drill. Then it escapes, following the flutes and by way of the hole (a), Fig. 6, and thence through the tubular stem, carrying the chips along with it. This drill is very useful for very large holes, that is, those over an inch and a half in diameter. In order to break the chips, the saw cuts (c), Fig. 6, are made in the face of the cutting lip. They are staggered on either lip.

This device is a rather elaborate one, but where a number of large holes have to be chucked it well pays for itself, and where such work is regular practice, none better can be devised.

Owing to the short length of these drills they may be made of high speed steel without excessive first cost.

How to Obtain Different Drills.

The twist drill shown in Fig. 6 is a commercial article and can be bought in all sizes from $\frac{5}{8}$ to 3 inches in diameter. The drills shown in Figs. 1 to 5 are not on the market, but have to be made special. These drills are patterned after those used in the manufacture of shoulder arms mentioned above, and are commonly called gun drills. In the early years of deep hole drilling the half-round drill was known as a gun drill and it is no doubt from this half-round drill that the straightway drill described here was developed.

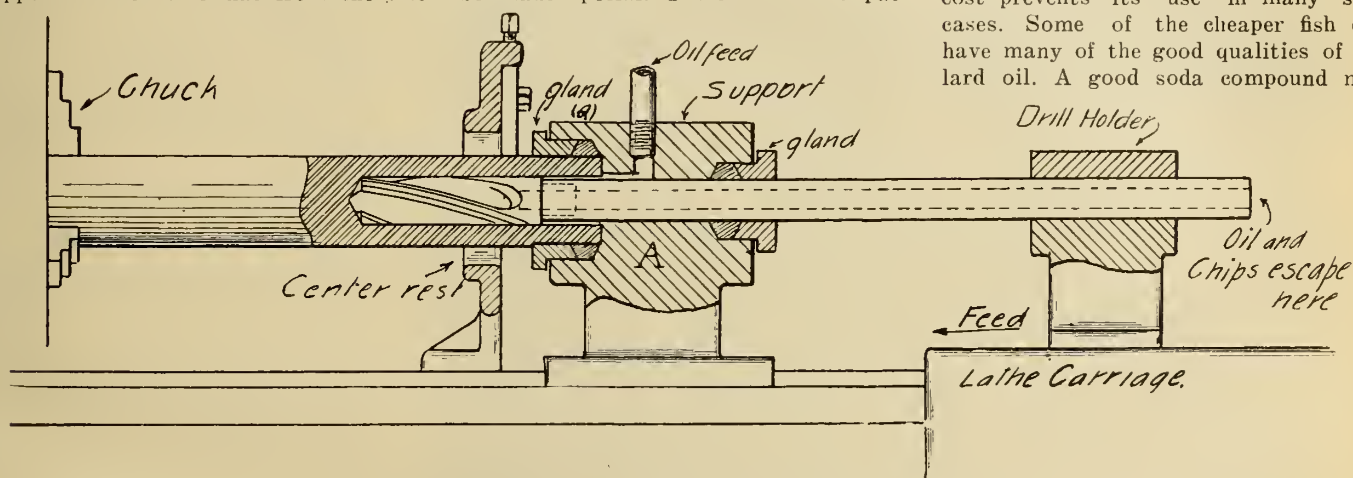


Fig. 7.—Method of Using Special Deep Hole Twist Drill.

Difficulties Owing to Quality of Work.

The difficulties that are met with in chucking a long hole in a piece of steel are many, and the material worked must be of the best quality in order that satisfactory results may be obtained. One of the worst troubles that we encounter is the presence of seams in the centre of the work. These are liable to occur in bars of the lower grades, and in order to be entirely free from such the bar must be thoroughly worked when hot. Hard spots are another serious hindrance to the production of a straight and true hole, as they will always cause the drill to run. They are caused by poor annealing of the material and uneven cooling.

When a hole starts to run, the work should be turned around and a hole started from the other end. In this way what would have been a badly out of true hole may be made to run fairly well.

When a very true hole is desired, the outside of the bar should be roughed off, removing any internal strains. Work that requires chucking in this manner should have an extra allowance of stock on the outside for trimming off as the removal of the central portion of the bar is liable to cause it to take a new shape, due to the releasing of initial strains in that portion of the material.

There are a number of cutting compounds and oils on the market at present, all of which have some peculiar value as an agent in keeping the cutting edge cool and in carrying away the chips. Lard oil has long been the leader of all cutting lubricants, but its high cost prevents its use in many such cases. Some of the cheaper fish oils have many of the good qualities of the lard oil. A good soda compound may also be used, but unless it is quite heavy it is of little value.

CLOSING LONDON OFFICE.

The Canadian Manufacturers' Association has decided to close their London office for the present.

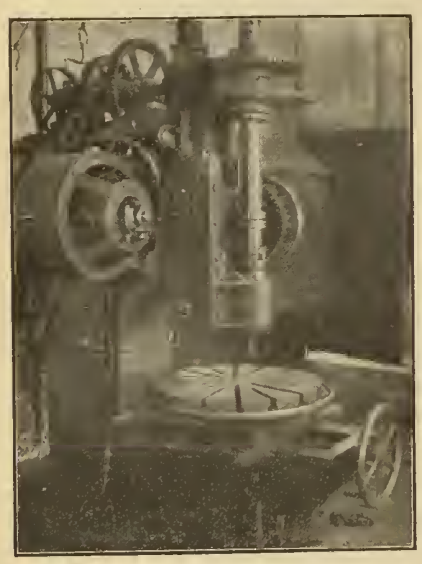
POWER BY-LAW PASSED.

At the recent municipal elections all the power by-laws voted upon in Western Ontario were carried, with the exception of that in Ingersoll, which by-law was to provide the expenditure of $50,000 for the purchase of the local light company's plant. By-laws were passed in following places: Toronto, $270,000; Hamilton, $275,000; London, $235,000; Galt, $66,000; Brantford, $55,000; Guelph, $50,000; St. Thomas, $42,000; Stratford, $35,000; Waterloo, $10,000; New Hamburg, $10,000; Hespeler, St. Mary's, Woodstock.

Motor Application to Machine Tools: Horsepower Formulae

Data prepared by the Westinghouse Co.—Kind of Motors to use for different tools—Formulae to determine the horsepower required for tools

The conditions under which machine tools operate are so varied that it is impossible to represent by empirical



Westinghouse Motor Driving Vertical Milling Machine.

formulae the exact horsepower which should be used in all cases. The formulae given below, however, are based on the assumption that tools made of water-hardened steel are used, and the average cutting speed has been taken at approximately 20 feet per minute.

Where high speed tool steels are used, the horsepower required by the machine tools will increase approximately as the increase in the cutting speed.

Broadly speaking, machine tools may be divided into two classes, first, those with direct rotary motion of either work or cutter, and, second, those with reciprocating motion of either work or cutter. The first head comprises lathes, boring mills, milling machines, drill presses, etc., while the second class comprises planers, shapers, slotters, and machines of similar character.

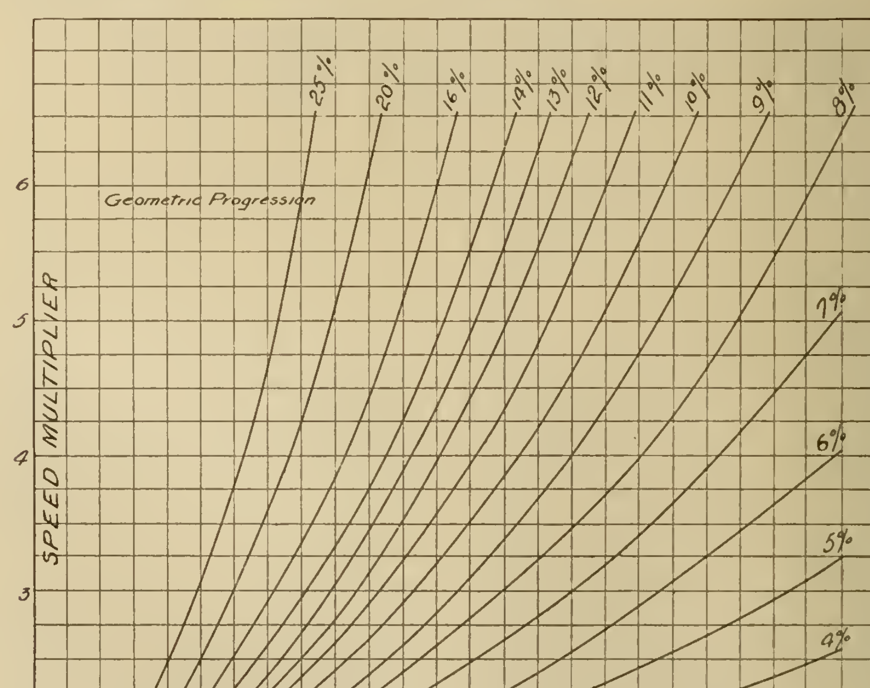
Under abnormal conditions of either machine or work, the formulae will give horsepowers very much smaller than those which should be applied to the various machines. Such conditions, however, must be considered as abnormal, and motors specified with this point in view.

Motors for Direct Drive.

The variable speed motor has decided advantages in the way of economical production. With the old method of speed variation, i.e., by means of cone pulleys or nests of gears, coarse increments in speed only were obtainable. This invariably means that the machine tool cannot be worked up to its limit of productive capacity. With the new high speed steels, necessitating greater pulling power in belts and increased strength in gears, reasonably fine increments in speed are almost impossible, due to the increased length of the cone pulley, or the abnormally large size of the change gears required to obtain the necessary speed changes.

For this reason the variable speed motor may in some cases actually decrease the cost of the machine tool by eliminating the extremely bulky and expensive mechanical speed changing devices.

The approved practice in the matter of cutting speeds makes the ratio between the various speeds increase in geometrical progression, and as it is somewhat laborious to calculate in each case what the speeds will be on the controller notches, the curve shown in the cut has been prepared. This curve has been laid out on the basis of standard Westinghouse practice.



The vertical represents the total increments in speed, the horizontal the controller notches, while the curved lines each represent a certain percentage of the increase between the notches. For example, on the 15th notch of the controller having 14 per cent. increments, the speed will be 6.25 times the initial speed.

Controller Considerations.

In general, the handle of the controller used in connection with variable speed motors should be located convenient to the operator, as near to the other handles on the machines as possible. For example, good practice places the handle of the controller used in connection with a motor on a lathe upon the tool carriage, so that speed changes may be made without the necessity of the operator's leaving his position. Connection between the controller handle and the controller proper should be made as rigid as possible in order that the notches on the dial of the controller may correspond as nearly as possible to definite running positions on the controller itself.

Armature resistance has been used for the control of variable speed motors to a considerable extent in certain industries and has been productive of very

good results. Examples of uses to which armature resistance may be satisfactorily applied are as follows: Printing presses, print rolls, plunger pumps, air compressors, paper machinery, positive blowers, blowers, fans, centrifugal pumps, hoists, conveyors, bending rolls, cranes.

Armature resistance has also been tried in connection with the operation of machine tools, such as lathes, boring mills, etc., and has invariably resulted disastrously.

The condition imposed upon a motor driving machine tools is one of constant horsepower throughout the whole speed range, and this is a condition which cannot be met when armature resistance is used.

A second important characteristic of the ideal machine tool motor is good inherent regulation, i.e., a comparatively small decrease in speed from no load to full load. A machine when running on armature resistance fails signally so far as this characteristic is concerned.

Aside from the above two objections to armature resistance it should be noted that this method of control is extremely wasteful in current and should not be used except in cases where the torque decreases very materially with the decrease in speed, or in cases where the cost of current is so low as to be negligible.

The Westinghouse Company has consistently taken the stand that the use of armature resistance in connection with machine tool work is decidedly objectionable, and until some new method of using the same is devised, they claim that while this method of control is extremely attractive theoretically, in practice it has failed signally; so often that it cannot be recommended.

Machines Having Rotary Motion.

In general motors to be used for lathes, boring mills, drill presses, etc., should be shunt wound variable speed motors with good inherent speed regulation.

Horsepower for Different Tools.

1. Lathes.

Engine lathes using one cutting tool of water-hardened steel at about 20 ft. per minute:

H.P. equals .15 S—1.

Heavy engine lathes, such as forge lathes:

H.P. equals .234 S—2.

In all cases, S equals swing of lathe in inches.

2. Boring mills.

For the operation of standard boring mills using one cutting tool of water-hardened steel at approximately 20 ft. per minute, the following formula will be found to represent good practice for heavy work:

H.P. equals .25 S—4.

Where S equals swing of mill in inches.

3. Milling machines.

For normal milling machines using water-hardened steel cutters running at about 20 ft. per minute, the following formula will be found useful:

H.P. equals .3 W.

Where W equals distance between housings in inches.

4. Drill presses.

For normal drill presses using water-hardened steel drills, running at a peripheral cutting speed of approximately 20 ft. per minute:

H.P. equals .06 S.

For heavy radial drill presses:

H.P. equals .1 S.

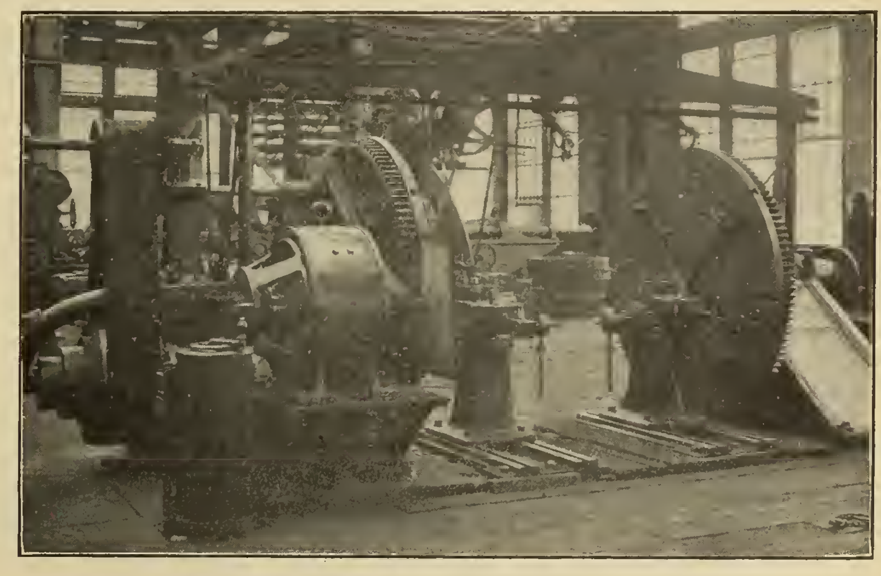
Where S equals swing of drill in inches.

In general, if high speed tools are used, running at a higher cutting speed than those given, the increase in horsepower should be approximately proportional to the increase in speed.

Machines Having Reciprocating Motion.

Machines of this character are from their nature less productive than machines having a purely rotary motion of either cutter or work. For this reason it is especially important that machines having a reciprocating motion be run to the limit of their capacity.

This of course requires a variable speed motor, similar to the motor described in connection with rotary motion machines, except that in the case of machines having a reciprocating motion the compound wound motor should be invariably used. The compound wound motor is useful in that at the instant of reversal of the machine tool, when the torque required of the motor increases very considerably above the normal, the compound winding assists materially in holding the inrush of current within reasonable limits, and this may be further improved by the use of the flywheel.



Westinghouse Motor Driving Wheel Lat he.

The following figures show average practice, so far as horsepower required for operation of some of the typical reciprocating machines is concerned.

1. Slotters.

Normal crank slotters, using water-hardened steels at cutting speeds of from 15 to 20 ft. per minute:

Stroke	Horsepower
16 inches	3
18 inches	3½
24 inches	5
30 inches	6½

2. Shapers.

Shapers using water-hardened tool steels at cutting speeds of from 15 to 20 ft. per minute:

Stroke	Horsepower
16 inches	3
18 inches	3½
24 inches	5
30 inches	6½

3. Planers.

For normal planers using water-hardened steel at cutting speeds of from 15 to 20 ft. per minute. By normal planer is meant a planer in which the length of the bed in feet is approximately two-tenths the width between the housings in inches. For example, a 48-in. planer would have a length of platen of approximately 9.6, or 10 ft.

H.P. equals 3 W.

Where W equals width between housings in feet.

For heavy forge planers:

H.P. equals 4.92 W.

The above formulae are for planers having a ratio of cutting to return speeds of approximately 1 to 3, and cover planers with two tools in operation. If more than two tools are used,

or if the ratio between the forward and return speeds is more than 1 to 3, the horsepower given by above formula should be increased.

It should be noted that where the length of bed is greater than that mentioned above the horsepower should be increased. It is a singular fact that the horsepower specified in connection with planers is determined more by the current inrush at the instant of quick reverse than by the horsepower required to actually machine the metal. In an extensive series of tests it has been found that invariably the horsepower at quick reverse is the deciding factor. It is dangerous to greatly overload the motor at the instant of quick reverse for the reason that under some conditions, as for example, on very short stroke, the overload on the motor may be fairly continuous, and our experience indicates that motors for operating planers should be rather more liberally rated than those for almost any other machine tool application.

In connection with lathes, boring mills, milling machines, drill press, slotters and shapers, it has been found necessary to devise empirical formulae, which represent the horsepower required by the cutting tool as a function of the metal removed. These formulae have been extremely useful and show an astonishing agreement with tested results where the quality of material is known. On account of the variations in the quality of the material, however, they are not of general application.

Application to Drills.

The action of a twist drill is peculiar in that aside from the actual cutting action there is more or less of a binding action between the drill and the side of the hole. The formula connecting the horsepower with the other variables is as follows :

$$H.P. - (\times \text{cu. in. per min.} + L) \times \frac{R.P.M.}{100}$$

K is the empirical constant, as is also L. L, however, is entirely rational, in that it represents the friction of the drill on the side of the hole.

It has also been found that when drilling horizontally, approximately 20 per cent. less power is used than in the case of vertical drilling, owing to the fact that the drill clears itself of chips much more readily. This is particularly true in the case of cast iron.

Lathes and Similar Machines.

It has been found that the formulae connecting the horsepower at the tool with the known variables in the case of lathes, boring mills, etc., assumed the following form :

H.P. equals $L \times A \times V \times (C-r)$.

In which L is the empirical constant, A is the area of the cut in square inches, V is the cutting speed in feet per minute, C is the included angle of the tool, i.e., 90 degrees (the rake plus the clearance), and (r) is a second empirical constant. It has been found that after the material has once been determined, that formula is correct to within ten per cent. The above formula applies particularly to wrought iron and steel. The formula for cast iron is considerably-more complicated and for approximate working, the above formula may be used. The constants depend entirely upon the character of material being machined, its hardness, its heat treatment, etc., and it will be of little use to give these constants here.

Aside from the horsepower required at the tool, whether it be a lathe tool or drill, it is necessary to obtain a definite idea as to the horsepower required to operate the various machine tools when running light. It has been found from an extensive series of tests that this horsepower varies widely, and it is therefore practically necessary in each case to make a study of the machine to be motor-driven. The above formula may be useful in approximating the horsepower required under given conditions, but it has been found that it is impossible to derive any formula which will take account of all the operative conditions, and the results given by judgment, based on the character of the work, personnel, and numerous other factors.

Consideration of Power Presses.

This table presents average good practice, for the presses mentioned. Motors for press work should in all cases be compound wound, and care must be exercised in starting on account of the flywheel, which makes it possible to get an extremely heavy inrush of current during the acceleration period.

Name	H.P. of Motor
P.G. 6 Ferracute press	7.50
S.G. 86 Ferracute press	5.
C. 5 Ferracute press, direct geared	3.
P. 21 Ferracute press, 18 in. throat, direct geared	2
D.G. 56 Ferracute drawing press	10
P. 3 Ferracute press	3
P. 2 Ferracute notching press	1
C. 92 Ferracute notching press	1
E. 4 Ferracute press, roll feed attached	3
Bliss No. 18 flywheel press	0.50
Bliss No. 19 flywheel press	1
Bliss No. 20 flywheel press	1
Bliss No. 21 flywheel press	2
Bliss No. 52 flywheel press	2
Bliss No. 30 A press, geared	3
Bliss No. 36 press, geared	5
Bliss No. 32 double crank press, geared	5
Bliss No. 5, double crank press, geared	7.50
Bliss No. 47½ press, geared	1
Bliss No. 74½ press, geared, with side cut-off slide	4
Bliss No. 1⅝ toggle drawing press	5
Bliss No. 3½ toggle drawing press	5
Bliss No. 68 N flywheel drawing press and roll feeds	2
Bliss No. 102 cut and carry gang press, geared,	3
Bliss No. 105 circular shear	0.50
Bliss No. 105½ circular shear	1
Bliss 36 in. geared power shear, 1¼ in. sheet steel	5
Bliss Stiles No. 0 flywheel punching press	0.50
Bliss Stiles No. 1 flywheel punching press	1
Bliss Stiles No. 2 flywheel punching press	1
Bliss Stiles No. 3 flywheel punching press	2
Bliss Stiles No. 4 flywheel punching press	3
Bliss Stiles No. 5 flywheel punching press	4
Bliss Stiles No. 5 press, geared, on heavy work	5
Bliss Stiles No. 172 sprue cutter, flywheel	2
Bliss Stiles No. 173 sprue cutter, flywheel	2
Bliss Stiles, No. 200 auto'c board lift drop	3
Bliss Stiles No. 400 auto'c board lift drop	4
Bliss Stiles No. 400 auto'c board lift drop	7.50
No. 2 Hilles & Jones combined punch and shear	5
No. 3 Hilles & Jones combined punch and shear, with 36 in. throat, punching 1¼ in. holes through 1 in. cast iron	10
No. 3 Hilles & Jones combined punch and shear, 12 in. throat, punching holes through 1 in. iron	7.50
No. 3 Hilles & Jones, 20 in. throat, horizontal press, capable of punching 1 in. through ¾ in. iron	7.50
Hilles & Jones 36 in. throat, single punch, cutting 1½ in. hole through 1 1-3 in. iron	10
No. 3 Hilles & Jones angle shear, cutting 6x6x1 in. stock	10
No. 6 Williams & White, 20 in. bulldozer	7.50

It is interesting to note that the occupation of the Jew in Russia is much more largely manufacturing and much less largely commercial than is commonly supposed. According to Russian official statistics, 37.9 per cent. of all Jews gainfully employed were engaged in manufacturing and mechanical pursuits, 19.4 per cent. in personal service, and only 31.6 per cent. in commercial pursuits.

The Disc Grinder; Recent Developments and Practice

Success of Small Grinders; Development of Double Head Grinder; Example of Work Done on Modern Grinder, Giving Record of Time.

By F. N. GARDNER

In a former article I gave some abridged history of the origin of disc grinders, and will now consider the development of these machines during the last eighteen years.

The very first machines sold were equipped with cast iron disc wheels, 10 in. diam. x ⅝ in. thick. They were belted to transmit possibly 1½ to 2 H. P. to the wheels running at 2,500 R.P.M. The wheels were faced with emery cloth, or paper, seldom coarser than No. 36 grain, and usually much finer. A considerable number of these machines were built and sold, and probably nearly all of them are still in constant use, for a disc grinder is a very long lived machine.

Small Grinders a Great Success.

These little grinders carrying 10 in. wheels were fitted with various styles of tables for supporting the work and very excellent and accurate results were obtained from them, on such work as snap gauges, fitting small keys, backing off taps and reamers free hand, etc. A skilful filer or bench hand having free run of one of these machines, would do half his work with it, do it better and in half the time that he can do it with a file.

Way back in the early days, say 1893 to 95, was what might be called the fancy, or trick disc grinding age. Much attention was given to producing samples of close and accurate work and not much attention to the time taken to produce it. It was a common thing for a careful workman to grind a number of tubes from rough steel so accurately to 1 in. square that it was difficult to find an error in the size or angles with a micrometer caliper and accurate try square. A number of these 1 in. cubes (say six—could be laid together with any possible combination of the different sides, and the six cubes would measure six inches over all within a small fraction of one one-thousandth of an inch.

Building of Large Machines.

The success of these small machines for accurate work and light manufacturing was so marked and attracted so much attention that it was decided to build a larger machine and a "whale" as we thought it then, was designed. This monster carried wheels 18 in. in diam. x ½ in. thick. The belt would transmit, possibly, 4 to 5 H.P. to the wheels at 1,800 R.P.M. Manufacturers were induced to make emery cloth and paper as coarse as No. 24. Everyone that saw the machines at work was struck with wonder that emery cloth would "grind like that, and not be instantly torn to shreds." A large number of these 18 in. machines were sold—many of them for work they were entirely unsuited for.

Several concerns started in to build disc grinders, and almost invariably equipped them with 18 in. wheels, which were supposed to be about the limit of size.

The Disc Grinder: Showing Operator Performing Certain Work

Development in "Double-head" Grinder

Up to this time all disc grinders were single head machines, i.e., they had only one head and spindle. They usually carried a wheel and were equipped with work tables, at both ends of the spindle. No provision was made for pressing the work against the wheels, except with the fingers and hands of the operator, and that was about all the pressure that the abrasive circles then in use conld stand, except on pieces of quite large area, and such pieces could not be successfully ground.

The next development following closely after the first 18 in. machines, was the "doubled head" disc grinder. This machine consisted of two heads mounted on a long bed similar to a lathe bed. The left hand head was fastened rigidly to the bed at the extreme left hand end. The right hand head was movable and could be fastened at any point on bed. Each spindle carried one 18 in. disc wheel on the inside end only. The right hand spindle was mounted in sliding bearings, and could be moved forward and back by a hand lever attached to one of the bearings. The forward motion of the lever was governed by a screw stop. Work supports of any required width were extended between the wheels. Pieces to be ground were placed on these supports and the wheels were moved towards each other by the hand lever. The work being free to move on the support is forced against the wheels with equal pressure. This was the first application of a lever to increase the pressure of work against a disc wheel. As a general rule doubled head disc grinders are suited only for work having equal opposite and parallel faces,

such as nuts, bolt and screw heads, cutter blanks, thrust collars, small gear blanks, wrench heads, etc. They turn out work rapidly and by means of screw stop, duplicate work can be produced with considerable accuracy. By use of special attachments and fixtures, which are usually rather expensive, work can be done with a double head grinder when the opposite faces are not equal, or when a varying amount of stock must be removed from the opposite faces, but as a rule I do not recommend it and prefer to use a single head machine for such work.

Building Heavier Machines.

As before stated, the efficiency of the earlier machines was limited chiefly by emery cloth and paper used in connection with them. No. 36 emery was for several years the coarsest grade, but later No. 24 was obtainable. The old style machines were about strong enough and furnished power enough for all these abrasive circles would stand, but with the advent of circles (or discs) made expressly for use on disc grinders and much heavier and stronger than common commercial emery cloth and paper, it was found that the machines then in use did not allow anything like full efficiency being obtained from the wheels.

A marked advance in the art of making abrasive circles or discs has been made within the last two or three years. 20 in. circles are now obtainable that will remove, i.e., grind off, $\frac{3}{8}$ to $\frac{1}{2}$ a cubic inch of steel per minute and last several hours at that rate. Cast brass can be ground four to six times faster than steel. Circles are now made in Nos. 16, 14 and 12 grades.

To meet this greatly increased efficiency in circles some at least of the disc grinder builders have brought out much heavier and more powerful machines carrying wheels 20 in. to 26 in. diam. and $\frac{3}{4}$ in. to 1 in. thick. Special tables equipped with lever feed are provided for them. A 20 in. disc wheel faced with No. 12 and No. 16 abrasive will use 15 to 20 H.P. and give good return for the power used. A disc grinder carrying 20 or 23 in. wheels should be belted to transmit 20 to 25 R.P. to the wheels. This is a big jump from the four or five H.P. that can be used on the older machines. It should be noted that under proper conditions the work turned out by a disc grinder will be about in proportion to the power consumed. This of course applies to rapid manufacturing operations when the whole power of the machine can be used.

Results of Actual Test.

The following record made on grinding samples in my own shop may serve as an opening leading to practical data on the present use of disc grinders. The illustration in connection gives a fairly clear idea of the machine and operation. The samples were grey iron castings for water meters.

Record :
Number of pieces ground....................25
Size outside .... 5 in. x 7 in.
Area of surface ground about 17 sq. in.
Total time of grinding, ...27 minutes
Average time on each piece, $\frac{1}{4}$-100 mins.
Av. thickness of metal removed, 25-1000
Rate of removing metal, 390-1000 cubic inches per minute.

The above report is by no means exceptional for speed of output. It gives the result of a first trial by an operator who was inexperienced on that particular job. A new and much higher record has doubtless been made by the people who bought and are now using the machine.

Referring to cut, it will be noted that the pieces being ground are not fastened rigidly to the table, but are loosely hung on pins set in face of angle plate. This allows rapid handling. Most of the pieces shown were handled over two or three times before being ground to an accurate plane. This called for fifty to sixty handlings in 25 minutes, and proves clearly to anyone who has noted letter on disc grinding in January number of Canadian Machinery the reason in my statement that "fixtures and holders should be designed to allow rapid handling of work."

NEWS OF THE SOCIETIES

SOCIETY OF CHEMICAL INDUSTRY

A practical paper was read before the Canadian section of the Society of Chemical Industry, Montreal, on Jan. 3. The paper was entitled : "Chemistry: Its Value in Modern Foundry Practice," and was written by Milton L. Hersey, M.Sc., provincial government analyst, and Ira B. Lesh, consulting foundry expert, Chicago.

WESTERN BRANCH OF C.I.M.E.

A western branch of the Canadian Institute of Mining Engineers has been formed at Nelson, B.C. Officers were elected as follows : President, A. B. W. Hodges; secretary, E. Jacobs; executive council, P. S. Couldrey, R. H. Stewart, L. Hill, O. E. S. Whiteside, W. M. Brewer, J. C. Haas, E. C. Musgrave, J. McEvoy and S. G. Blaylock.

ENGINEERS' CLUB OFFICERS.

At the meeting of the Engineers' Club of Toronto, on Jan. 9, officers for the ensuing year were elected as follows :

President—J. G. Sing.
1st Vice-President—A. B. Barry.
2nd Vice-President—C. M. Canniff.
Treasurer—L. J. Street.
Secretary—R. B. Wolsey.
Directors R. G. Black, W. J. Fuller, W. Van R. Reynolds.

OFFICERS OF C. S. C. E.

The annual meeting of the Toronto branch of the Canadian Society of Civil Engineers was held in the society rooms Jan. 24, when Charles H. Mitchell was elected chairman for the year 1908 to succeed Mr. E. H. Keating who resign-on account of contemplated absence from the city. Mr. Thos. C. Irving, jun., was elected honorary secretary-treasurer, and the election for the executive committee resulted in Messrs. Mitchell, M. J. Haney, Irving, Simpson and Norman McLeod being elected.

The general annual meeting of the Canadian Society of Civil Engineers takes place next week in Montreal. Mr. C. H. Rust, city engineer, has declined to allow his name to stand for the presidency of the society, so that Dr. John Galbraith, principal of the School of Practical Science, is elected president for 1908 by acclamation.

MEETING OF C. R. & E. P.

The first meeting of the year of the Canadian Railway & Engineering Club of Canada was held on Tuesday evening, Jan. 21. At this meeting the new officers took up their duties. New officers are :

President—W. R. McRae.
Vice-President—Acton Burrows.
Second Vice-President—C. A. Jeffries.
Executive—J. J. Fletcher, Canada Foundry Co., Toronto; J. Bannon, chief engineer, city hall, Toronto; J. C. Garden, general foreman G.T.R., Toronto; H. G. Fletcher, rep. Garlock Packing Co., Toronto; Geo. Black, road foreman, G.T.R., Stratford; A. Dixon, general foreman C.P.R., Toronto Jct.; R. Patterson, master mechanic G.T.R., Stratford.
Audit Committee—F. G. Tushingham, chief engineer Tor. Ry. Co.: Geo. Baldwin, Canada Foundry Co., Toronto; R. N. Card, car distributor G.T.R., Toronto.

The meeting was a very good one, there being given a good paper on compressed air for shop work by Jas. Duguin, foreman of G.T.R. machine shop at Stratford. The discussion was participated in by men from G.T.R. shops in Stratford and Toronto and from Canada Foundry Co. and Toronto Street Railway.

MACHINE SHOP METHODS AND DEVICES

Unique Ways of Doing Things in the Machine Shop. Readers' Opinions Concerning Shop Practice. Data for Machinists. Contributions paid for.

STANDARD BOLTS.

By. Geo. P. Pearce.

The accompanying table of total safe loads on U.S. standard bolts cannot be found in any book and I have found it very useful in designing. I used the following formula for working out this table.

Total safe load

$$=\left(D-\frac{1.299}{t}\right)^2\frac{\eta}{4}. S$$

D=Diameter of bolt.

t=Number of threads per inch.

S=Safe stress per sq. in.

This is made up from the standard sellers formula where the diameter ,d, at the root of the thread is:

$$d=D-\frac{1.299}{t}$$

This squared and multiplied by II-4 gives us the area at the root, which, multiplied by the safe stress per sq. in. gives the total safe load.

Diameter Fractional	Diameter Decimal	No. of Threads	Area of Bolt	Area of Root of Threads	Safe Load at The Following Stresses per sq. in. 4000 lbs	5000 lbs	6000 lbs	7000 lbs.	8000 lbs	9000 lbs
1/4"	.25	20	.049	.027	108	135	162	189	216	243
5/16"	.3125	18	.077	.045	180	225	270	315	360	405
3/8"	.375	16	.110	.068	272	340	408	476	544	612
7/16"	.4375	14	.150	.093	372	465	558	651	744	837
1/2"	.5	13	.196	.126	504	630	756	882	1008	1134
9/16"	.5625	12	.249	.162	648	810	972	1134	1296	1458
5/8"	.625	11	.307	.202	808	1010	1212	1414	1616	1818
3/4"	.75	10	.442	.302	1208	1510	1812	2114	2416	2718
7/8"	.875	9	.601	.420	1680	2100	2520	2940	3360	3780
1	1.	8	.785	.550	2200	2750	3300	3850	4400	4950
1 1/8"	1.125	7	.994	.694	2776	3470	4164	4858	5552	6246
1 1/4"	1.25	7	1.227	.893	3572	4465	5358	6251	7144	8037
1 3/8"	1.375	6	1.485	1.057	4228	5285	6342	7399	8456	9513
1 1/2"	1.5	6	1.767	1.295	5180	6475	7770	9065	10360	11655
1 5/8"	1.625	5 1/2	2.074	1.515	6060	7575	9090	10605	12120	13635
1 3/4"	1.75	5	2.405	1.746	6984	8730	10476	12222	13968	15714
1 7/8"	1.875	5	2.761	2.051	8204	10255	12306	14357	16408	18459
2"	2	4 1/2	3.142	2.302	9208	11510	13812	16114	18416	20718
2 1/4"	2.25	4 1/2	3.976	3.023	12092	15115	18138	21161	24184	27207
2 1/2"	2.5	4	4.909	3.719	14876	18595	22314	26033	29752	33471
2 3/4"	2.75	4	5.940	4.620	18480	23100	27720	32340	36960	41580
3"	3.	3 1/2	7.069	5.428	21712	27140	32568	37996	43424	48852
3 1/4"	3.25	3 1/2	8.296	6.510	26040	32550	39060	45570	52080	58590
3 1/2"	3.5	3 1/4	9.621	7.548	30192	37740	45288	52836	60384	67932
3 3/4"	3.75	3	11.045	8.641	34564	43205	51846	60487	69128	77769
4"	4.	3	12.566	9.993	39972	49965	59958	69951	79944	89937
4 1/4"	4.25	2 7/8	14.186	11.329	45316	56645	67974	79303	90632	101961
4 1/2"	4.5	2 3/4	15.904	12.743	50972	63715	76458	89201	101944	114687
4 3/4"	4.75	2 5/8	17.721	14.226	56904	71130	85356	99582	113808	128034
5"	5.	2 1/2	19.635	15.763	63052	78815	94578	110341	126104	141867
5 1/4"	5.25	2 1/2	21.648	17.572	70288	87860	105432	123004	140576	158148
5 1/2"	5.5	2 3/8	23.758	19.267	77068	96335	115602	134869	154136	173403
6"	6.	2 1/4	28.274	23.098	92392	115490	138588	161686	184784	207882

Standard Bolts.

FINISHING GAS ENGINE FLY WHEELS.

By John Carlson.

There are certain designs of wheels that will permit of finishing to excellent advantage with one operation, which will affect a material saving in time over methods requiring a second operation.

The carriage of the machine here illustrated, which is a Gisholt turret lathe, is equipped with a wing rest, or auxiliary tool post, mounted as shown.

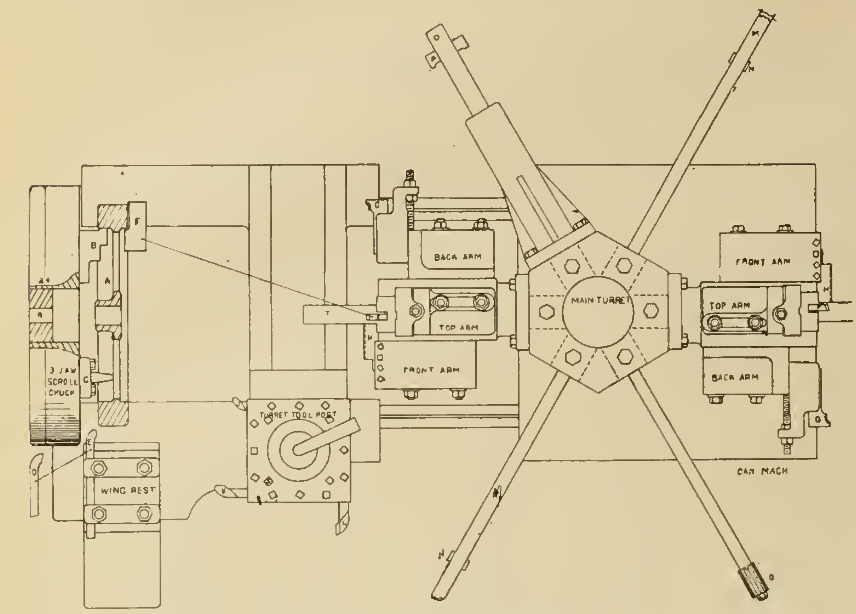
The facing heads hereinafter referred to are the adjustable tool holders shown on the main turret, and have inscribed on them the words "Front Arm," "Top Arm," and "Back Arm."

The piece "A" is first chucked on the inside of the rim with special hard chuck jaws "B." The pieces "C" are clamped to the face of the chuck as stops, so that each piece may be chucked in exactly the same position. The first operation consists in rough-boring the hole. This is done with the double-ended cutters "N," held in boring bar "M," the bar being supported in the chuck bushing at "R."

While boring the hole, tools "J" and "K" are used for breaking the scale on the front face of the hub and rim. Tool "K" in the turret tool post is used for breaking the scale of the periphery. Tool "E" in the wing rest is used for breaking the scale on the back face of the rim. As soon as the scale is removed the hole is finished with cutter "N-I" and "M-1" and reamed with a reamer "Q" mounted on a floating arbor.

Next, the cutters, "F," "G" and "H" in the facing head are used for rough-facing the front of the rim and hub. The facing head is supported in

the finished hole by the arbor "T." The front of the rim and hub face are then finished with the cutters "F-1," "G-1,"



Finishing Gas Engine Flywheels.

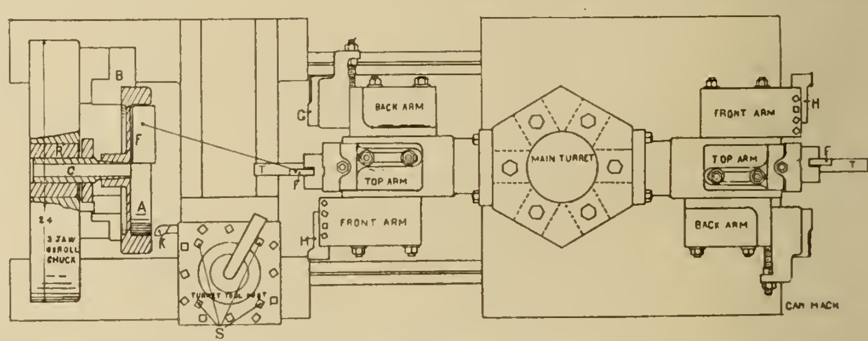
and "H-1" in the finishing iacing head.

The periphery is finished with the cutter "L" and the back face with the cutter "E," the cutter "D" being used for rounding inside of rim.

For finishing the back of the hub, the cutter "P" is removed from the boring bar "O;" this bar is then inserted through the bore and the cutter "P" re-inserted in its slot; the turret carriage is then backed away, and the rear end of the hub faced.

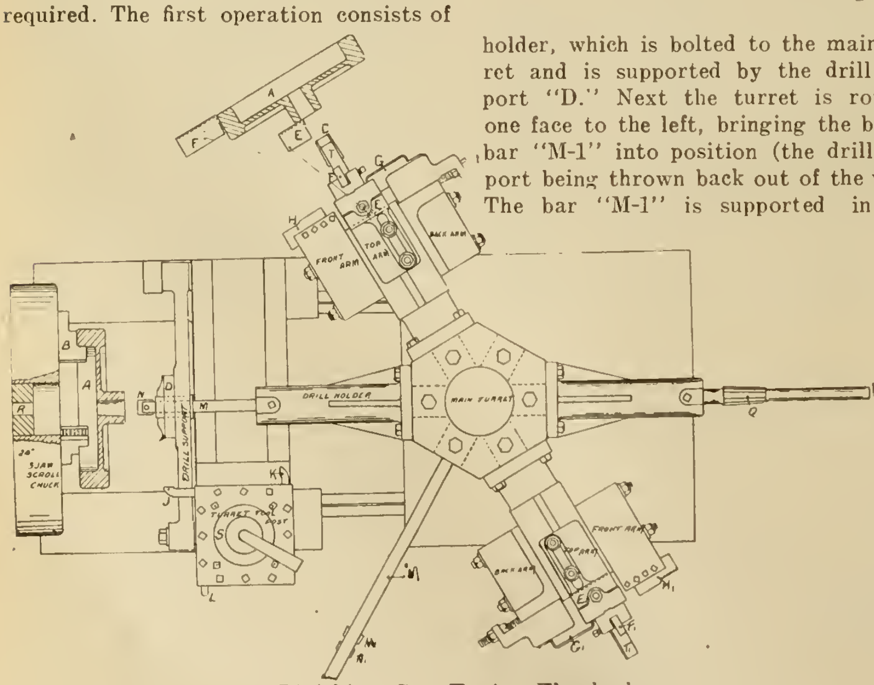
In the case of a webbed wheel which is finished all over, two operations are required. The first operation consists of the following steps: The piece is chucked at "A" on the inside of the rim with regular inside hard chuck jaws "B." First we rough-bore the cored hole with the cutter "N" in the end boring bar. This bar is held in the drill holder, which is bolted to the main turret and is supported by the drill support "D." Next the turret is rotated one face to the left, bringing the boring bar "M-1" into position (the drill support being thrown back out of the way). The bar "M-1" is supported in the chuck bushing "R," the two cutters "N-1" and "N-3" being used to rough out the hole preparatory to using the taper reamer "Q" shown on another face of the turret. The small end of the hole is finished to within .002 in. by the cutter "N-1." While boring with the bar "M-1," the scale is broken on the web and hub of the piece with the tool post tools shown at "J" and "K." The scale on the periphery of the piece is broken with the tool post tool "J." The hole is reamed with taper reamer "Q" supported in a bushing in the chuck, and a taper bushing "C" is then inserted for receiving the supporting arbor "T" in the facing head. The piece is rough-faced and turned with cutters "E," "G," "H" and "F" in the facing head. This brings the piece approximately to size. For finishing, the cutters "G-1," "E-1," "H-1" and "F-1" in the finishing head are used, this head being supported in the taper bushing "C," a light cut being taken for finishing.

In the second operation the piece is chucked on the outside diameter with soft slip jaws "B" which are bored to the exact diameter of the piece. The piece is further supported in the hole with the sliding bushing "C," which is held in the chuck bushing "R."



Finishing Gas Engine Flywheels.

First we break the scale on the web and inside of the face of rim with the tool post tool "K." These surfaces are then roughed off with the cutters "F," "G" and "H" in the facing head, the arbor "T" being inserted in the bushing "C" for supporting this head and the piece is brought approximately to size. Next a light cut is taken with the cutters "F-1," "C-1" and "H-1" in the finishing facing head, which completes the operation.



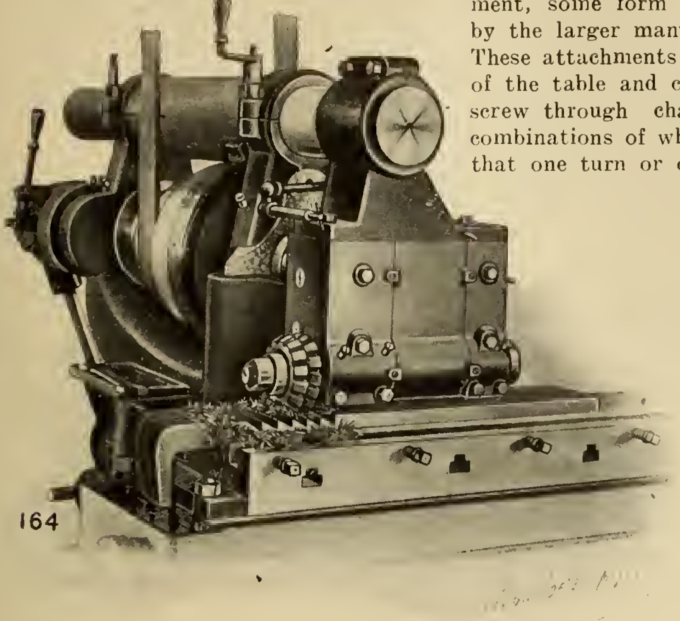
Finishing Gas Engine Flywheels.

RACK MILLING.

By C. S. Gingrich.

In some lines of manufacture a great many cut racks are employed and in such cases it is without doubt profitable to install an automatic rack milling machine. However, in a great number of shops racks are used in the course of manufacture but in such small quantities as to not warrant installing a special machine for cutting them. In such cases the milling machine is usually depended upon for doing the work

and to those who have this sort of thing to do the data given below will no doubt prove interesting.



Rack Milling.

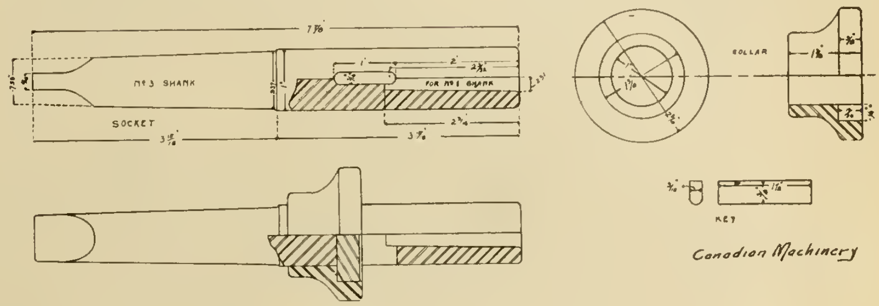
I have selected for this illustration a No. 3 plain Cincinnati miller fitted with No. 2 rack attachment. The bars being milled are forged steel and three bars are held in the vise at one time. The rack teeth are spaced $\frac{7}{8}$ in. pitch and they are cut 7-16 in. deep. The cutters are $4\frac{1}{2}$ in. diameter and cut two teeth to the full depth at a single cut. For such work the machine must, of course, be fitted with power cross feed and in the present example a feed of .075 per revolution of cutter is used, giving a table movement of $2\frac{1}{2}$ in. per minute.

The indexing of such work can be done from the dial provided on the end of the lead screw and by following the readings given on the chart, which is usually sent with the machine by all makers. This however is very much simplified by a rack indexing attachment, some form of which is supplied by the larger manufacturers of millers. These attachments are fitted to the end of the table and connect with the lead screw through change gears, different combinations of which can be set up so that one turn or one-half turn of the crank gives the desired spacing of the work being milled. Although the illustration shows racks having teeth engaging a pawl, it is obvious that racks for engaging a pinion can be cut by the same process.

DRILL PRESS COLLET.

By A. E. D.

I have seen descriptions and illustrations of several drill press collets and have used several different kinds but for repetition work with taper shank drills, the one illustrated herewith has given the best satisfaction. It is both economical and efficient for no time is lost stopping the drill but changes are easily made, keeping the drill press running continuously. The collet in the illustration is made to fit a No. 3 taper spindle in the drill press and to hold a No. 1 taper drill. The collet consists of the taper drill holder and a collar with crossbar as shown in detail and assembled as shown in the complete view. When working on a long bar and drilling several different holes, as is sometimes necessary, especially in agricultural shops, this collet is found to be a time saver. The tapered part is machined as shown in sketch and the collar is slipped over and the bar slipped through the ports in the taper part and the collar is riveted over it at the ends. This bar is sometimes rounded on both edges and left square only where it is riveted into the collar. This prevents any possibility of the bar jamming in the ports where it must play up and down easily. Suppose in bar there were quarter, five-sixteenths and three-eighths holes to be drilled in a bar, then this collet can be used. To change the drill, tap with a copper hammer on the collar and insert the next drill and tap it into place. It is found that by using a copper hammer the ring is not damaged and such a collet will last for years. These collets can be made in any taper to suit any drill presses and any taper.



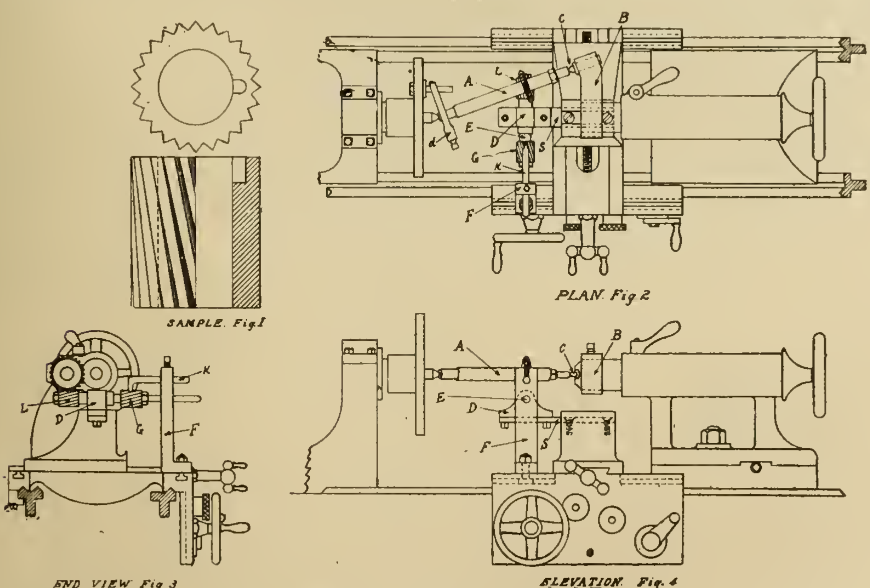
Drill Press Collets.

MILLING ON THE LATHE.

By J. H. R. Hamilton.

Wishing to mill a quantity of crimping beads like sample sketch, and not having a milling machine in the shop that would cut spirals, the arrangement like that shown in the sketch was rigged up on the lathe, and although not perfect, the beads were cut very satisfactory.

The sample Fig. 1 shows the bead



Milling on the Lathe.

to be cut, which is used (in pairs) to crimp the inserted end of a length of stovepipe.

Figs. 2, 3 and 4 show the attachment fastened to the saddle of the lathe.

A is the cutter arbor carried between the centres of the lathe and driven by the dog D.

Bracket B is fastened on the spindle of the tail stock with centre (c) inserted so as to come in line with live centre when cutter is at the proper angle, to avoid undue wear on the dead centre.

The strip S is bolted to the base of the tool post, and carries a bracket D which supports the work arbor E at the proper height.

The angle plate F is bolted to the saddle and carries the free end of the work arbor.

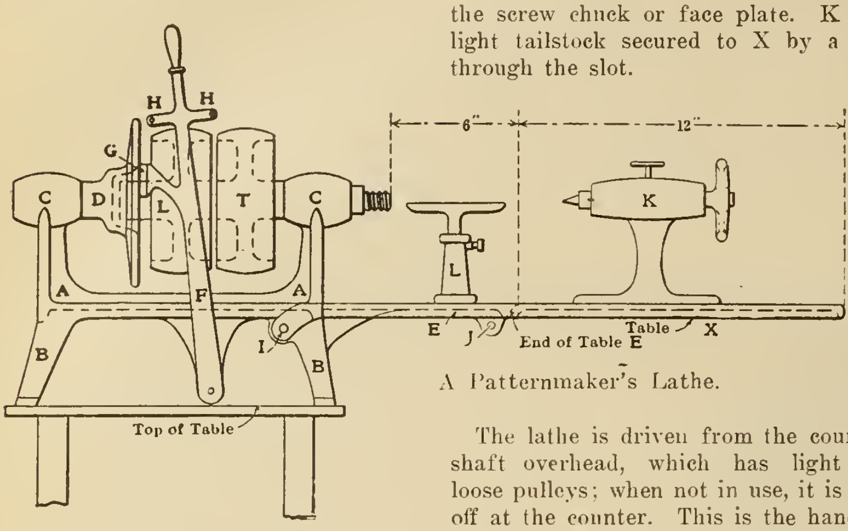
Above the work arbor is an adjustable finger, (k) sliding in the template bead G, which revolves the blank L as the cut advances.

A PATTERNMAKER'S LATHE.

Herewith is a sketch of a small high-speed wood lathe for small wood-pattern turning. It is the only one of the kind I ever saw and it is in constant use at all times.

Frame A, legs B, bearings C and table E are cast in one piece. The spindle is hollow and has face plates, centre drives, drill chucks, etc. D is a friction disk secured to the spindle; L is a loose pully, and T is tight. To insure good bearing, the loose pulley is made with a long hub extending into the recess in the friction disk. F is a belt shipper which also carries a brake shoe G acting against disk D, causing the lathe to stop quickly when desired. H H are belt-shipper fingers.

On the other side of E is cast a lug J, and there are also corresponding lugs on table X. A hole is drilled through these lugs, and a pin through these locks X in place. Lugs I are extensions from X, forming a hinge to allow table X to drop down out of the way when turning on the screw chuck or face plate. K is a light tailstock secured to X by a bolt through the slot.

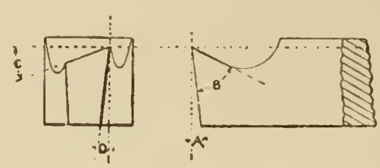


A Patternmaker's Lathe.

The lathe is driven from the countershaft overhead, which has light and loose pulleys; when not in use, it is shut off at the counter. This is the handiest tool ever put into a pattern shop.—American Machinist.

CUTTING ANGLE OF TOOLS.

The best results can only be obtained from a machine tool if the cutters are correctly ground. It follows that all cutting tools should be ground to a gauge. The Practical Engineers' Pocket Book for 1908 gives the following correct cutting angles for different materials:

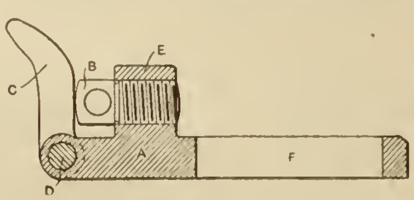


Cast iron.	Steel.	Wrought iron.	Brass	Hard O. M or chilled iron.
deg.	deg.	deg.	deg	deg
A = 3	A = 3	A = 8	A = 3	A = 3
B = 70	B = 60	B = 56	B = 80	B = 85
C = 15	C = 20	C = 26	C = 10	C = 6
D = 3	D = 3	D = 8	D = 3	D = 3

Cutting Angle of Tools.

HANDY PLANER DOG.

The accompanying cut shows a simple planer dog, which can be used to advantage on almost any class of work. On very heavy work, however, the relative proportions of the body A are rather light, and should be increased. The design of the appliance is very simple, and is plainly shown in the cut. A body A is provided with a lug E, into which is threaded screw B, the other end of which bears against the binder C, swiveling around pivot D. The body A is clamped in the T slots in the planer table, a long slot F being provided for adjustment. A drilled hole in screw B makes it easy to turn the screw when binding the clamp C against the work. O. G.



Handy Planer Jig.

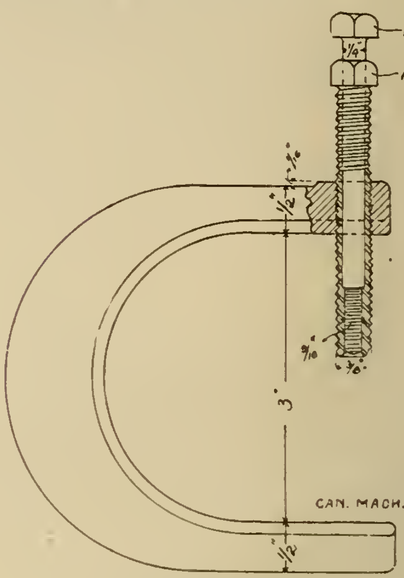
NON-SLIPPING CLAMP..

By P. Bovey.

The clamp shown is found to answer the purpose for which it was made, O.K.

The idea of the small screw is to prevent the nuisance of the clamp slipping when it is being tightened.

In using, A is tightened slightly, then B is screwed down to take the whole strain.



Non-Slipping Clamp.

For a 6-in. clamp the dia. of the large screw is $\frac{3}{4}$-in., 10 threads, the small one $\frac{1}{2}$-in. dia, 11 threads, with the shank 17-32 in.

CAUSE OF INACCURACY.

By P. Bovey.

In boring a large casting in mill or lathe, you might have noticed that the hole is slack to the gauge when examing latter.

The cause of this is seen here. Take a hole, for instance, where about 1 inch of stock is to be cut out to fit a 3 in. plug gauge.

You find the casting gets very warm at the edge of the hole in the process to the depth of an inch or so. Naturally the metal must expand, and the only possible way for it to do so is in the hole, simply because the cold metal all around will not expand at all.

Well, the machinist boxes the hole to the gauge, which is a good fit at the time, but when the iron cools and contracts you will find the hole is slack to the gauge.

DEVELOPMENTS IN MACHINERY

New Machinery for Machine Shop, Foundry, Pattern Shop, Planing Mill; New Engines, Boilers, Electrical Machinery, Transmission Devices.

BROACHING MACHINE AND TOOLS.

The accompanying illustration, Fig. 1, is of a broaching machine cutting keyways, made by the La Point Machine Tool Co., Hudson, Mass. A group of samples showing various shaped holes broached on this broaching machine, is shown in Fig. 2.

It might be said that the broaching proposition has probably gained more in popularity during the last five years than any other machine within the same time, because of the rapidity with which it cuts keyways in holes and broaches square holes. The facility with which square holes are made on this machine has increased the use of them. On account of the expense of square holes, many were using keyways, but now have adopted the use of square holes.

The machine was originally designed by Mr. J. N. Lapointe four years ago, especially for cutting keyways in holes. It has a capacity to cut ordinary keyways in change or feed gears at the rate of 100 or more per hour, or in longer pieces such as cutting $\frac{3}{8}$ in. or $\frac{1}{2}$ in. keyway 6 in. to 7 in. long in a pulley or any other hole at the rate of one minute. This rapidity, facility and method of doing work on this machine soon led to the idea that square holes or any shaped holes could be broached to advantage, which was at once taken up by its designer and was accomplished with success, and since then the machine has been widely used for broaching square, hexagon, octagon and various shaped holes as desired.

Operation of Machine.

For cutting keyways in holes, a work bushing to fit the size hole is mounted on to the nose of the machine, as shown in the illustration. This work bushing has a groove in it, in which to allow the cutterbar or broach to slide. This cutterbar or broach is screwed to the sliding head of the machine and pulled over the work. The cutterbar is tapered and gradually increases in width from the neck to the end, which acts as the feed to make each tooth cut its proportional part, as it is being pulled through. For instance, if a keyway is to be $\frac{3}{8}$ in. wide 3-16 in. deep, the cutterbar would taper 3-16 in. from the neck to the end. When the cutterbar is extending the entire length out of the machine its width at that point is such that the work can be slipped on the bushing without the depth interfering, and as soon as the machine is started, as the first tooth comes in contact with the work, it begins to cut its proportional part. Each tooth continues so until the whole length of the bar has passed through to complete its work. Then the work is easily slipped off from the brushing and by throwing over the operating lever of the machine, it returns the cutterbar, so as to project the entire length out of the machine and the same performance is repeated by passing another piece of work over the bar and slipping it over the bushing, ready for action. No clamp or fastening of any form is required to hold the work on the machine.

For broaching square holes or any shaped holes, if castings, steel or any other metal, in some cases the form of the hole can be cored out to fit the neck of the broach, but in most cases when being done in solid metal it is then necessary to drill a round hole a fraction smaller than the square to be made, so as to admit the neck of the broach. For instance, on a $1\frac{1}{4}$ in. square hole 2 in. long, $1\frac{1}{4}$ in. less 1-64 in. drilled hole would be drilled, then one broach could do the operation in one minute. Should the same size hole be

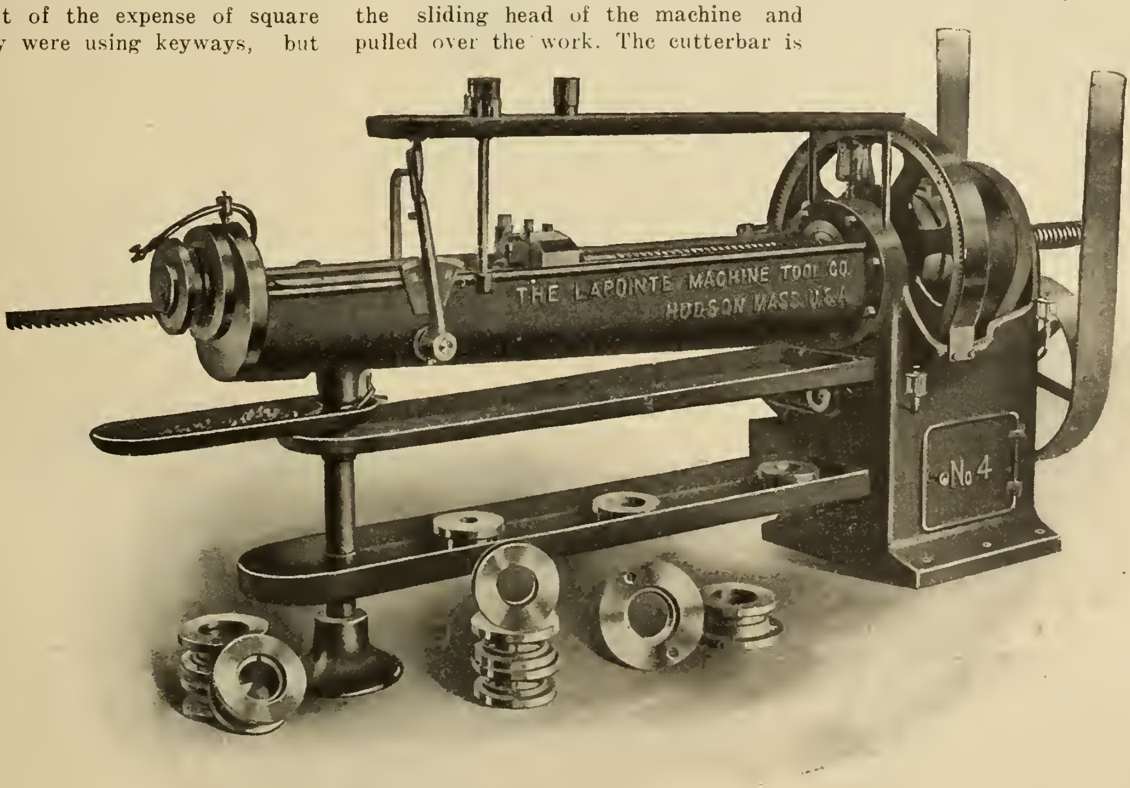


Fig. 1—La Point Broaching Machine.

4 in. long, more or less, it would require two or more broaches, dependent on the length of the hole.

In broaching square or any shaped holes, the neck of the broach is passed into the hole, and then connected to the machine by means of a key, which takes but one second to connect same, and in most cases to operate a broach through and the whole would consume about one minute to two minntes.

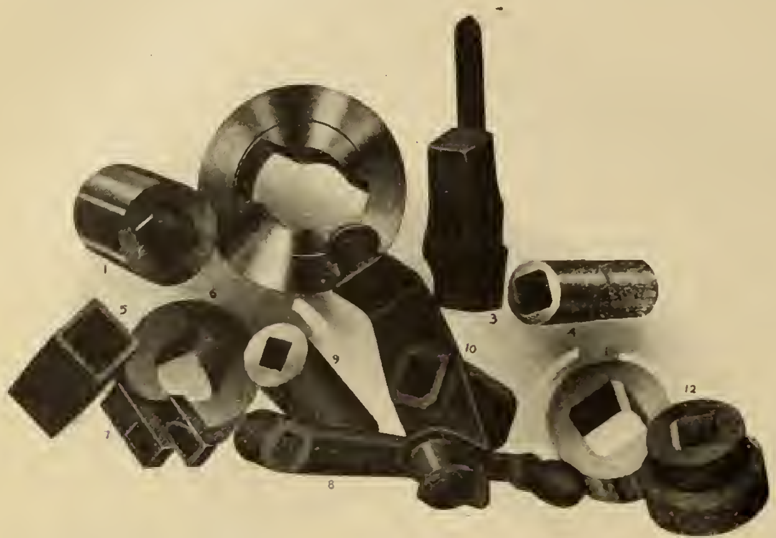


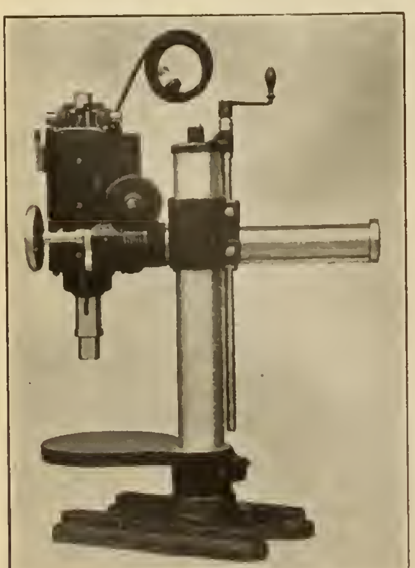
Fig. 2—Samples of Work Done on the Broaching Machine.

Four, five or six keyways can be cut in a round hole in one operation by means of a broach made to cut the number of grooves or keyways required.

LARGE PORTABLE ELECTRIC DRILL.

This is the largest portable electric drill yet made. It is made by Hisey-Wolf Machine Co., Cincinnati, O. This machine will drill up to a two-inch hole.

The drill has a 12-inch feed through the worm and gear on the hand-wheel shaft and a quick return. The feeding mechanism can be adjusted from a horizontal to a vertical position when the drill is to be used in corners or other places where space is limited.



Large Portable Electric Drill.

The motor has two speeds, under control of the hand by a thumb lever at all times and in spite of the size, the driving power is obtained from an ordinary lamp socket by the usual flexible cord. The motors are made for either direct or alternating current, as may be desired.

Both the horizontal and vertical columns are made from steel tubing, provision being made for raising and lowering the drill head by the screw shown and all horizontal adjustment being taken care of by the rack shown on this arm. The head also swings at any angle so that the operator has complete control of the drill, up and down the column, and with the swinging table can drill to the centre of a 24-inch circle and at any angle desired.

The use of portable tools is growing every day and there are few shops that cannot use a drill of this kind to advantage.

SCREW-DRIVING MACHINE.

In assembling small work in large quantities the problem of putting in the screws becomes important, as the constant use of a screwdriver, even of the rapid, ratchet, or other variety, is very apt to put a gain twist in the arms or wrist of any operator after a short time. To make the putting in of screws easier and much more rapid, the Reynolds Machine Company, Rock Island, Ill., brought out a machine which has now been improved as shown herewith.

The new machine is provided with two hoppers, so that two sizes of screws can be handled on the same job, not at once, but in any succession desired. These hoppers contain a revolving disk feed which carries the screws, head up, to the slide or chute and drops one after the other to the spring jaws at the lower end of the spindle. It has been found simpler to let both magazines brop a screw each time and let the unused screws fall into the proper cup, to be dumped back into the hopper when necessary, than to introduce any selective device into the mechanism.

The screw is held in the spring jaws, the screwdriver finding its way into the slot; a pressure on the foot lever brings down the driving spindle through a back lever connection and at the same time slightly raises the table by means of the cam and roller at the lower end of the screw. The raising of the table clamps the work between the table and the screw guide, and the further movement drives the screw into place.

The spindle is driven by the two friction collars at the top, under control of the spring above; when the screw is driven home, these collars slip until the foot is released, a new screw drops into place and the operator brings a new piece or a new hole under the screwdriver.

The table is adjusted for various thicknesses of work through spiral gears

Automatic Screw Driving Machine.

and the vertical screw, and the machines are used both to drive wood and machine screws in assembling work in quantities. In many places this enables wood screws to be driven without first boring the holes, and the machine will drive more than the screw will stand in any case, and without marring the heads of even brass screws. When it is considered that the spindle runs from 1,000 to 1,500 revolutions per minute, it is readily seen that the capacity of the machine is limited only by the ability of an operator to get work under the spindle.

The machine is made in three sizes, and with one or two hoppers as desired, also with an attachment so that screws can be driven close up inside the corners of boxes and similar places. The largest machine will handle wood or machine screws up to $2\frac{1}{2}$ inches long

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MITRE JOINT IN ONE OPERATION.

A machine for cutting the two parts to a mitre simultaneously has been recently patented by J. A. Fay & Egan Co., 362-382 W. Front St., Cincinnati.

It is claimed by the makers that it will do away with the necessity of a double operation and fitting by hand plane, and is therefore invaluable to picture frame manufacturers and others who have considerable mitreing to do.

Two pieces of molding are laid one across the other in front of the saw at an angle of 45 degrees; as the saw cuts there is equal pressure on either side of it so that the cut is absolutely true.

Mitre Joint in one Operation.

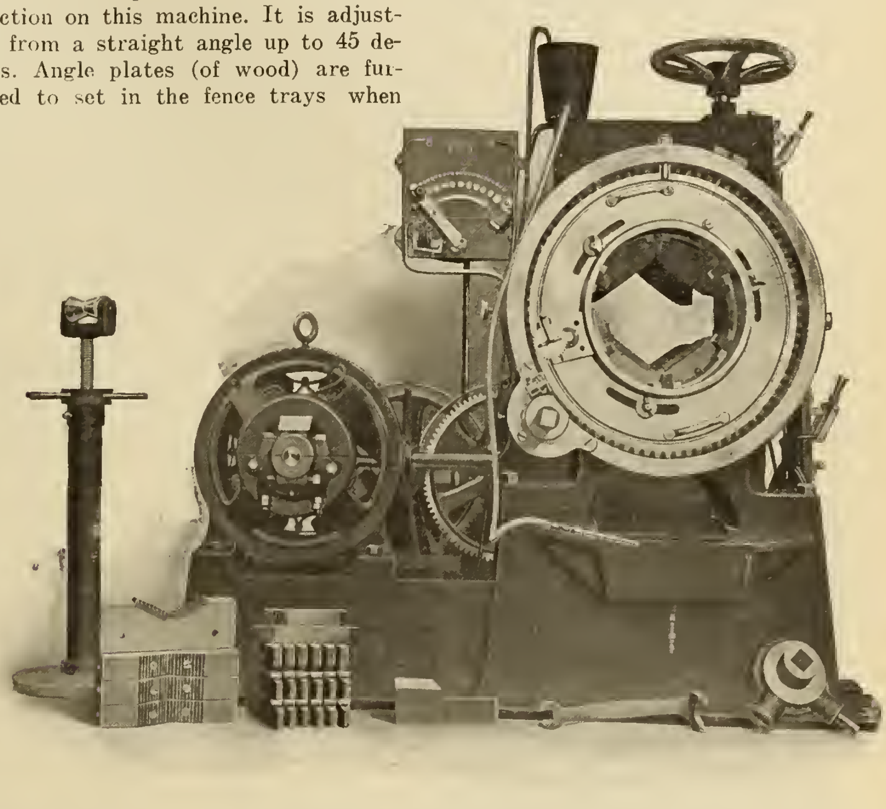
It cuts picture frame moldings up to 6 by $2\frac{3}{4}$ in., at any angle to 45 degrees. cuts straight joints up to 9 inches wide.

The frame is a sold, cast iron structure, free from vibration, whose table is mounted on frictionless rollers and moves easily.

Saw mandrel is hung on the swinging frame and the bearings are adjustable independently. The saw is hollow ground and the side vibration is eliminated by a guide under the table. The double fence is the important feature of construction on this machine. It is adjustable from a straight angle up to 45 degrees. Angle plates (of wood) are furnished to set in the fence trays when mitreing joints for picture frames to give a deeper set to the frame. Countershaft has T. & L. pulleys, 10 x $4\frac{1}{2}$ inch face, and should make 500 R.P.M. One 20 inch hollow ground saw is furnished with the machine.

FORBES PATENT DIE STOCK.

The introduction of electricity in machine shops has been quickly recognized as an economical and convenient power and the demand for direct-connected motor-driven machinery is, on this account, increasing day by day. In the machine shop and power plants where



Forbes Patent Die Stock.

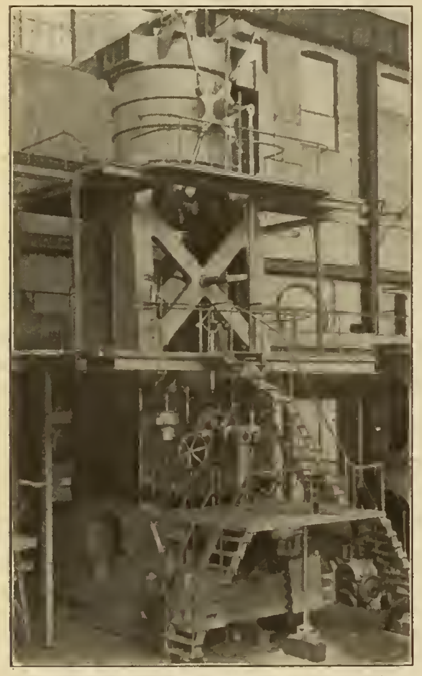
much pipe threading must be done and in the plumbing and steamfitting trades the electric power has been adapted for cutting and threading, and the Forbes Patent Die Stock, illustrated in the accompanying cut, is operated with a direct connected motor.

The machine is complete with motor, rheostat, switches, wiring and machine, all on one base and owing to the method of revolving the dies around the pipe the machine is extremely compact and sufficiently light to be portable. The range of the threading machine illustrated is from $2\frac{1}{2}$ to 12 inches. This is also manufactured in size 1 to 6 inches, and owing to the various currents used in the different cities and towns prices on these machines are supplied with motors suited to any voltage or current.

The Rheostat, with which the machine is provided, performs the functions of starting and stopping the machine, regulates the speed at any desired point, and automatically protects the machine against breakage which might be caused by carelessness or mistakes on the part of the operator; for unless the machine is handled as it should be, the Rheostat instantly cuts out the motor and the

machine immediately comes to a standstill.

As the wiring is complete on the machine it is but necessary to attach the feed wires to the receiving switch, and the machine is ready for use. For this fact the machine may be placed on a job or contract, thus establishing a power plant by the connection of the feed wires, and the loss of time and expense of carting pipe to and from the shop, is therefore eliminated. Still another saving which may be effected in the employment of an electric machine on large contracts, is its adaptability for being moved from point to point. As the work progresses, the machine may be moved from floor to floor or place to place by extending the feed wires, and the loss of time and labor of carrying



Allis-Chalmers Blowing Engine.

pipe to and from the machine located at any one particular spot on the contract, is avoided. Large heating and plumbing contractors will readily appreciate this valuable feature.

The Forbes Patent Die Stock is manufactured by Curtis & Curtis, Bridgeport, Conn., U.S.A.

ALLIS - CHALMERS BLOWING ENGINE.

The accompanying illustration is the latest style of blowing engines made by the Allis-Chalmers Co., Milwaukee. This engine is one of an order of this type being put through at the present time for Wickwire Steel Co., Tonawanda Iron & Steel Co., Pennsylvania Iron & Steel Co., and Republic Iron & Steel Co.

Apprentices Must Study the Machine

There is no way to advance from your present position except by learning the " How " and " Why " of your work in the shop.

BY WINFIELD W. DUDLEY

Education for the mechanical worker has become a necessity if he desires to advance. An uneducated mechanic cannot go beyond the grade of piece wage worker or day laborer unless he is above the average. He will not climb high unless he is brilliantly efficient in his work. It is not meant that a mechanic should have graduated from high school and a technical college, although a high school education is in the grasp of every boy and should be taken. On the contrary, the foreman in a shop will not hire a man who can show no other preparation for his trade than a jumbled assortment of book ideas. The mechanic who first learns his trade in actual construction work and then attends a technical school is the one who will advance. He knows how to study. He knows how to make profitable application in every principle learned in the classroom. His memory is not burdened by rules and equations, which do not picture to him an exact mechanical situation.

Needs to Understand Machinery.

It is the day of "specializing" that has made it necessary for a mechanic to have an education. Every machine shop, and, in fact, nearly every manufacturing plant run by machinery, now is so extensive that there are few men in any establishment who know anything about any other machine than the one upon which they are employed. If a man's machine breaks down he usually is unable to repair it himself and stands idle until the factory mechanic reaches the trouble.

"Why can't a man on a machine 'rubber' at the man on the next machine; learn another man's job; do other men's work in such idle moments, and, above all, study his own machine so that no general mechanic can come around and bluff him into thinking he runs a mystery."

Should Study the Whole Shop.

"That's all right," replied the mechanic who answered this question, "but the average shop worker doesn't think of such things. He wants to earn his money, and that's all. He thinks if he does more than the foreman expects of him he will be giving more labor to the firm than the firm pays for.

He fails to realize that to get ahead he must know not only how to do his own work well but how every man around him should do his task. Above all, he should know why certain things are done in certain ways and the results of every move. Most fellows plug along and never know a thing about the theory of what they are doing. Ask them why they are nailing lids on boxes or turning a lathe in a machine shop and you will get the answer: 'To make money.'

"These fellows remain at the same nailing machine or the same lathe that they have operated ever snce they entered the factory. If one of their fellow workmen invents an improved method of nailing boxes or trimming steel, they have to make way for some one who has kept up with the procession. They do not know how to adapt themselves to new methods. They cannot run the new machine."

Learn the "Why" of Your Work.

The complicated machinery of to-day makes it impossible for a man to understand it unless he is well versed in the principles of mechanics and their application. It is easy enough to hold a box up to a machine, push a lever with your foot, and watch a whole line of nails drive home under the pressure of the weights; but to know why those nails went into the right place and drove home at the first blow requires more thought than one gives to his task if he keeps pushing away with one ear listening for the whistle and one eye on the clock.

If a man studies his job he will find that there is much more to it than he ever supposed. If you are running a lathe or a grinder, study it. Study it from all standpoints. If you study it long enough you will find principles you little suspected in every one of the machine's simplest movements. Your machine will tell you how ignorant you are.

Night schools, correspondence schools, and Mechanics' journals will assist you in your search for knowledge. If you lost your opportunity to go to school in youth take the one that presents itself now. Don't remain in the same job forever.

IMPROVED TRANSPORTATION.

"The airship will be a tremendous improvement over all other methods of transportation."

"You bet you," responded Mr. Graball, with enthusiasm: "Why, we can not only place straps in the usual positions, but also suspend them from the bottom and hang an indefinite number of passengers in the ambient air."—Philadelphia Bulletin.

POWER GENERATION AND APPLICATION

For Manufacturers. Cost and Efficiency Articles Rather Than Technical.
Steam Power Plants ; Hydro Electric Development ; Producer Gas, Etc.

BELT TRANSMISSION.

By J. H. R., Hamilton.

The simplest and most usual arrangements of belting is by the use of open and crossed belts. The velocity ratio of all belt transmissions is inversely as the diameter of the pulleys.

For parallel shafting the only requirements necessary are that the pulleys should be slightly crowned and in line with each other, and the shafts lined up parallel. If guiding flanges must be used they should be recessed out at a, a, Fig. 1, as the belt will be guided on the pulley at point b, and being free from the flange until it leaves the pulley on the other side.

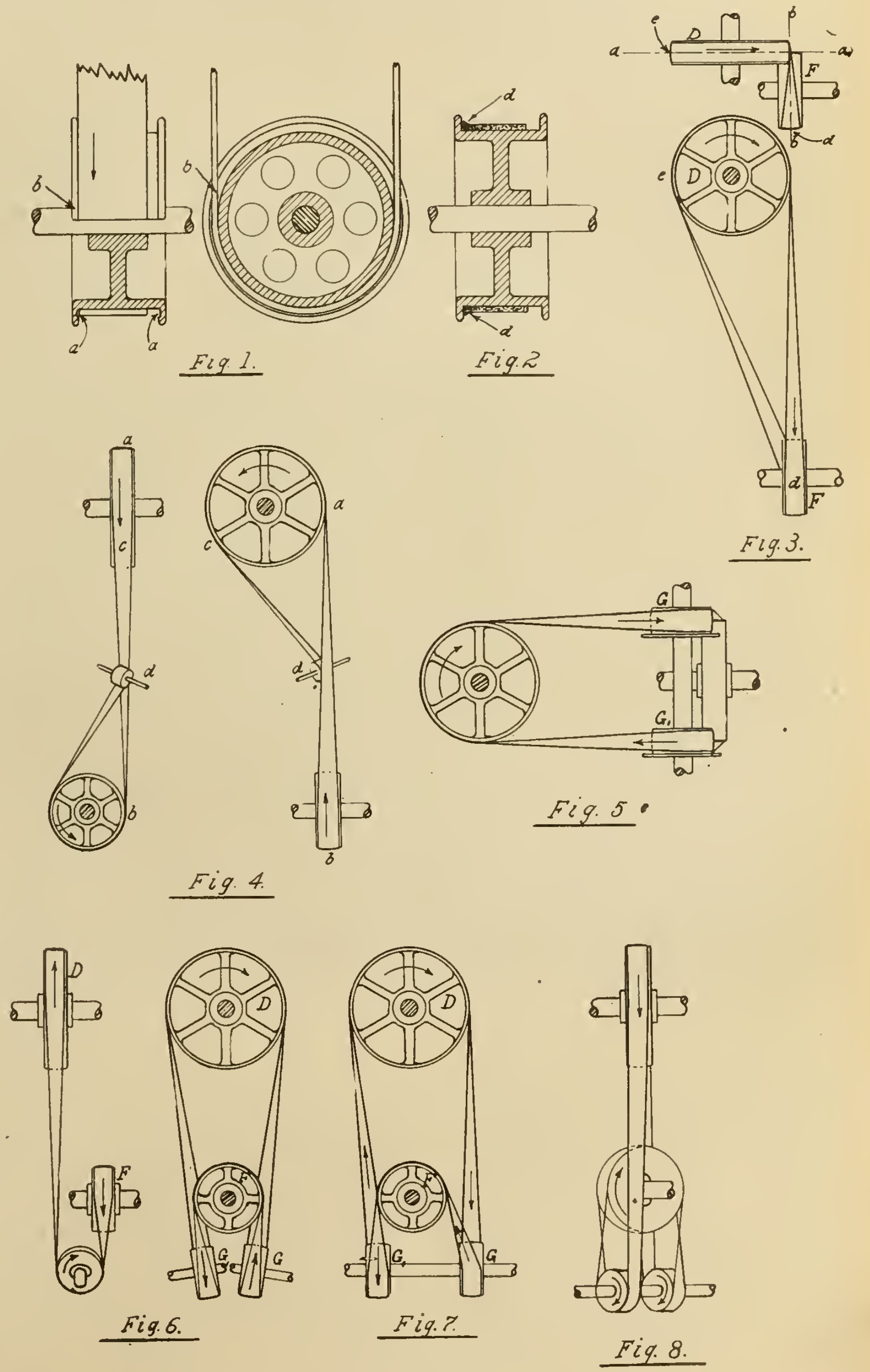
If flanges are left straight as in Fig. 2, the belt will be inclined to ride up on the flange as at d, causing undue friction and loss of power. When shafts are to be connected at right angles, but not intersecting, the common method is by a quarter turn belt, shown in Fig. 3. D isthe driver and F the driven pulleys. The point of delivery from pulley D must lie in the middle plane of pulley F and vice versa. Thus arranged the pulleys cannot run backward without dislodging the belt, because d, the point of delivery of F, is not in the middle plane a, a, and e is not in the middle plane b, b.

The objection to the quarter turn belt is that the belt is strained, especially at the edges, when the angle at which the belt leaves the pulley is large. Using small pulleys and narrow belting with shafts quite a distance apart, will overcome this to some extent, but, in any case, much power is lost by the use of quarter turn belts. In Fig. 4, the arrangement is somewhat improved by the use of a guide pulley on the slack side of the belt as shown at d. The working face of pulley d must be at the intersection of the planes a, b, and c, d.

When two shafts are to be connected which are in a horizontal plane and would intersect if prolonged an arrangement like Fig. 5 is usually used. Guide pulleys like those shown at G and G_1, called mule pulleys, are used with flanges on the lower side to keep the belt from falling off.

Guide pulleys are sometimes used to lengthen the belt between two shafts which are too close together to be directly connected or where two pulleys cannot be placed in the same plane. If the shafts are to run in either direction they should be arranged as in Fig. 6, the diameters of the guide pulleys being the distance between the planes of the two pulleys. But if the shafts are to run only in one direction it is more easily to place the guides on one shaft, as in Fig. 7, the belt being delivered from D to G to F_1 to G_1 and back to D, care being taken to have the belt delivered so as to strike the middle plane of the next pulley.

Fig. 8 shows two shafts connected which are not at right angles with each other. As the guide pulleys are running in the same direction they can be fastened on one shaft and the belt run in either direction.



Belt Transmission.

Producer Gas Installations in Canada and Tests of Them

New Municipal Plant Being Erected in Winnipeg; Record of Engine Test. Economy of Plants Installed in Boot and Shoe Factories and Printing Office in Montreal. Other Plants and Tests in Next Issue.

The largest producer gas plant yet placed in Canada is at present being installed at Winnipeg, at the municipal pumping plant for fire service.

The gas plant equipment consists of a pressure type producer gas plant of several units, totalling 4,500 horsepower capacity, designed to operate on bituminous coal, lignite or anthracite. There is also being installed a large gas holder intended to provide adequate reserve of gas for the engines. The engine equipment consists of four double cylinder tandem gas engines, each of 500 horsepower capacity; two engines of 250 horsepower each; also a couple of smaller engines for operating the air compressors for starting the large engines; in all there is a total of nearly 3,000 horsepower in engines.

The gas plants and engines were built by Crossley Bros., England, and are being installed with the co-operation of Lawrie & Lambe, consulting engineers, board of trade building, Montreal.

The six large gas engines are geared directly to six power pumps built by Glenfield & Kennedy, Ltd., Kilmarnock, represented in Canada by J. P. Farmer, hydraulic engineer, Coristine Bldg., Montreal. The manner of connecting the engines to the pumps can be seen in Fig. 1, which shows the northeast corner of the engine room, showing one of the larger units in the foreground, and one of the smaller ones in the background. The large gear and pinion just behind the large engine is the connection between the engine and the vertical pump, which is below the engine room floor.

The power plant is designed to supply water to the high pressure fire mains at a pressure of 300 pounds per square inch. One unit, consisting of producer gas plant, gas engine and pump, will always be kept at work maintaining adequate pressure in the fire mains, and in case of a serious fire all the engines and pumps are operated, taking gas from the reserve gas holder until all the producer gas plants can be started up, when each engine will then be supplied with gas by its own gas producer.

Fig. 1—Winnipeg High Pressure Station; Corner of Engine Room.

Concerning the Engines.

All the engines are single acting, which, as is well known, is strongly advocated by Crossley Bros. The four large engines have double cylinders, arranged in tandem as before stated, the glands in the front cylinder being packed with metallic packing. The cylinders of these engines are 32 ins. diameter and 36 ins. stroke. The speed is 120 R.P.M.

The engines are governed by varying the quality of the mixture, the volume of the charge remaining constant. The builders of these engines have devised a simpler form of valve mechanism to accomplish this than is commonly used. This varying of the mixture of air and gas is accomplished by varying the time of opening of gas valve, the gas and air valves always closing at the same time.

The engines are fitted with horizontal balanced exhaust valves, which, on account of the balancing provision, are operated very easily without excessive pressure on the side shafts. These valves are particularly handy for inspection and cleaning.

The crankshaft bearings are oiled by ring lubricators, and a system of forced lubrication distributes an ample oil supply to all working parts of the engine.

All the pistons and piston rods are water cooled. Duplicate electric ignitors are fitted to each cylinder.

Engine Tested in England.

One of these engines was subjected to a very exhaustive test before shipment by Dr. J. T. Nicholson, of the Manchester University, and formerly of McGill University, Montreal. The tests were undertaken with the object of measuring the brake horsepower of the engine and of gauging the gas consumption per brake per horsepower hour. The gas used, that from a producer, was also sampled, and analyses made, so that a computation of the thermal efficiency of the engine might be made. Observations were also made on the speed variation of the engine between full load and light load, so as to test the new system of governing introduced by Messrs. Crossley Bros., which acts, as before stated, by varying the timing of the first admission of the gas whilst always cutting off at the end of the stroke.

The consumption, capacity and governing trials were carried out on July 13 and 15, 1907, whilst further observations of the working of them, and another governing trial was made on July 22, 1907. Observations began after the engine had been running for nearly an hour so as to give it time to settle down. The amount of gas used was measured by noting the rate of fall of a large gas holder, when all sources of supply were closed, and only the engine was drawing from it. After the engine supply valve had been closed at the end of the trial, the further rate of fall of the gas holder, due to leakage from the mains and connections, was noted, and

the amount so determined per unit of time was deducted from the observed delivery from the holder during the trial. The temperature and pressure of the gas delivered by the holder during the trial were also observed so as to permit of the reduction of the gas used to an equivalent mass at the standard pressure of 29.92 in. of mercury, and a temperature of 32 deg. F.

The calorific value of the gas was determined both by burning a sample of it in a Junker's calorimeter during the trial, and by a chemical analysis taken from the supply pipe during the same time. The brake horsepower was obtained by means of a hand brake upon a special water-cooled pulley bolted to the flywheel. The weights of the various parts of the brake and the weights added during the trial were checked, and the distances between the centre lines of action of the weights were carefully measured.

The gas used was made from bituminous slack coal in a Crossley producer plant. The analysis of the gas gave the following results :

Carbon dioxide (CO_2)...............	11.4 p.c.
Unsaturated hydro carbons (C_2H_4 &c.).........	none
Oxygen (O)	1.0 "
Carbon monoxide (CO)............	15.1 "
Hydrogen (H)......	24.3 "
Methane (CH_4)	3.5 "
Nitrogen (difference) (N).........	44.7 "
	100.0

The calorific valve in accordance with this analysis, worked out to 156.5 B. Th. U. per cubic foot. The value obtained by the Junker's calorimeter was 149 B. Th. U. per cubic foot at the temperature and pressure of the instrument.

The volume of gas used by the en- of water. This equals 29,037 cubic feet 20 deg. Cent. and a pressure of 2½ in. of water. This equals 29,037 subic feet of gas at O deg. Cent. (32 deg. Fah.) and 760 mm. of mercury. The barometer readings were 30.21 in. The brake horsepower worked out to 559. The gas used by the engine per brake horsepower per hour at 32 deg. Fah. and 29.92 in. of mercury was therefore :

$$\frac{29,037}{559} \text{ equals } 51.94 \text{ cubic feet.}$$

Hence the heat supplied was 51.94 x 156.5, equalling 8,128 B.T.U. per brake horsepower hour. The thermal efficiency was accordingly :

$$\frac{2546}{8128} \text{ equals } .3132, \text{ or } 31.32 \text{ per cent.}$$

This result the report declares to be highly satisfactory. (There are 778 ft. pds. in 1 B.T.U. and 33,000 ft. pds. per mm. equalling 1 h.p. $\frac{33,000 \times 60}{778}$ equals 2,546 B.T.U. in 1 h.p.)

The engine was found to vary in speed from 119.4 to 121.4 revolutions per minute when the horsepower was instantaneously dropped from about 600 to 50. This represents a total variation of 1 2-3 per cent. of the mean speed. The full load was then thrown on again as quickly as possible, the same process being repeated again and again. The speed never varied more than the percentage mentioned above. No back firing took place.

Concerning the Pumps.

As before stated, the engines are direct connected to power pumps. The pumps are of the triplex, double cutting type, and they are driven by a cast steel gear, 9 ft. 3 in. in diameter, meshing with the gear on the engine shaft. The pinion is driven from the engine shaft through a Hele-Shaw patent friction clutch so that the engine can be started light, and the pump thrown on after the engine is in motion. This arrangement was adopted because there was some idea of using a large gas engine to drive an electric generator during the time when they would be called upon to furnish power for the pumps. With this object in view the design included clutches between engines and both the pumps and the generator, so that either one could be connected to the engine at a moment's notice. So far, however, the electric part of the installation has not been proceeded with. In starting the engines it is not necessary to disconnect them from the pumps by means of the friction clutch, and indeed in the case of the smaller engines there is no friction clutch installed, the pinion being keyed directly on an extension of engine shaft. In order to relieve

Fig. 2—Winnipeg High Pressure Station; Gas Producer House.

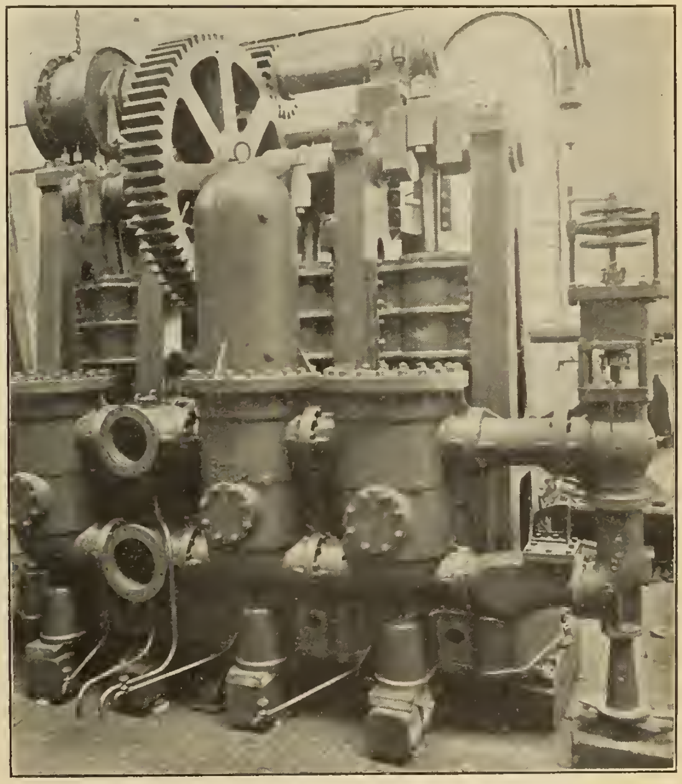


Fig. 3—Winnipeg High Pressure Station; Single Acting Pump.

the load on the engine at starting each pump is provided with a bye pass controlled by an hydraulically operated valve. When starting up, this valve is left open, so that there is no back pressure on the piston. As soon as the engine comes up to speed the bye pass can be gradually closed.

A flap valve with balanced weights and indicator shows the quantity of water passing through overflow. The hydraulic valves are operated by means of ordinary city water pressure, alternative hand gear arrangement being also provided.

The two large pumps and one small pump, with their engines, are arranged on each side of the engine house, with two lines of 20 in. mains running through the centre of the house, one main running right and the other left hand. There is an air vessel 30 in. x 18 ft. high in the clear at the outlet end of each main, with a sluice valve beyond the air vessel. Each set of pumps is connected to both of these mains with suitable valves to allow of pumping into either end of main at will. There is of course in addition a small air vessel on each pump. The connecting pipes between the pumps and mains are 12 in. and 9 in. dia. for the large and small pumps respectively. Suitable valves are provided for charging the air vessels by means of the air compressors provided for the gas engines.

The large pumps are 13⅞ in. dia., with a stroke of 18 in. and run at 35 R.P.M.; pistons are of gunmetal, fitted with double "L" leathers, diaphragm and junk rings; rods are of gunmetal, 4 in. dia., secured to piston by a nut and to crosshead by a strong cotter; cran shafts are of mild steel in one forging, having three throws for 18 in. stroke; crank pins, 9½ in. by 9 in. long, and 4 bearings 9½ in. by 14 in. long.

Those in Charge of Erection.

The erection of the plant is in charge of engineers sent out from England. For the gas engine builders, Mr. Philbrow is the superintending engineer and Mr. Basher is his assistant; for the pump makers, Mr. Myles is the superintending engineer.

TWO INSTALLATIONS OF DOMINION PLANTS.

One of the first installations of suction gas plants in Canada was made in the factory of Messrs. Dufresne & Locke, shoe manufacturers, Maisonneuve, Montreal, in July, 1904, by J. de Clercy, a French engineer, who had devised a special producer for American anthracite. This plant was constructed by Messrs. Farand & Delorimer, boilermakers, Montreal, and this type of producer was named the "Dominion Producer."

The power required by Messrs. Dufresne & Locke was 20 H.P. and a Tangye gas engine of that power was installed in connection with this producer. The ignition of this engine was made by city gas and the expense per week for that ignition was about 80 cents. In spite of that drawback the plant has given a large conomy, the total expense of fuel being from $3 to $4 per week according to the quality of the coal, instead of $12, the previous expense of coal for the boiler.

Messrs. Dufresne & Locke have tripled their factory and installed a 70 H.P. Dominion plant. To date twenty-two Dominion gas plants have been installed in the province of Quebec and United States.

Plant in Kingsbury Footwear Co.

In some plants gas plants have replaced other powers. Early in 1905 the Kingsbury Footwear Co., shoe manufacturers, Maisonneuve, Montreal, used 25 H.P. electric power to drive their machines, electric current for 250 incandescent lights in winter, anthracite coal for heating, and city gas for several heaters for irons, waxpots, etc.

They ordered two 35 H.P. Dominion gas plant at that time, one to run the factory, the other to drive a dynamo for lighting in winter. Each gas engine was put in connection at will with either producer and with the main shaft by means of clutch pulleys and clutch couplings. The advantages of this arrangement are economy of coal in summer, when only one engine is required, and a change of producer or engine is easily made to allow cleaning or repairs. After a year's running the power expense account showed a decrease.

Past Expense for Twelve Months.

Electric power, 30 H.P., and electric lighting	$2,575
Heating of factory	250
City gas for heaters, waxpots, etc.	175
Total	$3,000

Present Expense.

During the winter months for twelve hours' running the daily consumption was 600 pounds at $4.50 per ton of 2,000 pounds, or $1.33 per day. During the summer months the expense was 70 cents per day.

For the whole year, the expense of coal was $300. Instead of sifting the refuse of the producer that contained some unburnt coal after the poking of the fires at noon and in the mornings, a special grate was put in the furnaces to burn cinders, so that the heating of the factory was made with the refuse of the producer and cost nothing. The city gas was replaced by electricity for the iron heaters and waxpots, and this expense is included in the producer cost. City gas was furnished to the engine room for use in case of emergency at a cost for the year of $12. Lubrication of the engines, $70. A well was bored and all the water required is furnished by a rotary pump without cost. The linings of both producers were repaired at the end of the year, costing $40. For running the engines a man was taken who had been used as storeman and knew nothing about machinery. After a few lessons and three weeks' experience he was able to run the plant and keep everything in good order. For this and extra work he was paid $400. Total, $822. Difference of expense yearly, $2,178.

The total cost of the plant installed, without building, the dynamo and main shafting, was $5,800.

The stoppage amounted to one hour for the whole year and was due to some water having been drawn from the scrubber into one of the engines, but as the factory gets electric current by meter in case of emergency, no delay was caused. Previously stoppage amounted to 15 to 20 hours, due to defective current, storms, etc. After a year running the Kingsbury Footwear Co. doubled their factory so that the required power in summer was 60 H.P. and with the lighting of about 450 lights, 100 H.P. They installed a third Dominion plant of 30 H.P.

According to their calculations, their expense by the old means was $6,000 for the services of heating, lighting and power, and it is now $1,300.

MODERN PRINTING CO.'S PLANT.

Some time ago the Modern Printing Co., Montreal, had a 50 h.p. Kynoch producer gas plant and engine installed by Williams & Wilson, Montreal. A letter from E. Rolland, managing director of the Modern Printing Co., giving an account of one day's operating of the plant, is interesting :

"Our own engineer started the engine at 7 a.m. and it ran continuously until 6 p.m. when we close down. The producer plant was stoked three times only during the day, the last time being at 3 p.m. By actual weight, the coal consumed for the 11 hours run was 330 pounds, that is, 30 pounds per hour.

I estimate that we were taking about 25 H.P. out of the engine yesterday, that it is it was running at only half load. From the experience which I have had with the engine, I am satisfied we will not use more than a ton and a half of coal per week, when working at full load.

At the present rate, buying coal by the ton, this would mean $7.50 per week for coal, but this will be reduced

when we have space to accommodate a carload. At $7.50 per week for coal the yearly expense for coal would amount to $375.

The man I have in charge of the engine does not spend more than half his time in attendance on the engine, and the balance of the time we utilize him in running some of our printing machines. I am, however, charging against the suction gas plant $10 per week for the proportion of this man's time. This means $500 a year.

I am making a contract for the sale of part of the power from my engine. as 50 H.P. is more than I require.

Last year my power cost me $1,800, and with the suction gas engine I will be able to save at least $800 per year after paying all expenses, including interest on the investment.

Needless to say, I am very well satisfied with the results from producer gas."

PERSONAL MENTION.

W. P. Chapman has been appointed resident engineer of Mackenzie-Mann Co., Toronto.

* * *

Thomas J. Drummond, of Drummond, McCall & Co., has been elected president of the Montreal Board of Trade by acclamation.

* *

R. H. Sweetser, of Sault Ste. Marie, has accepted the position of superintendent of the Columbus Iron & Steel Co., Columbus, Ohio.

* * *

E. Marshall, formerly acting locomotive foreman for the C.P.R. at Outremont, Que., has been appointed general locomotive foreman at McAdam Jct., N.B.

* * *

W. J. B. Drew, until lately connected with the Canadian Society of Civil Engineers in a secretarial capacity, is now with the Montreal Light, Heat and Power Company.

* * *

W. Hall, who has recently been appointed superintendent for the electrical operation of the St. Clair Tunnel, was formerly chief engineer of the Canada Car Co., Montreal.

* * *

C. Murphy, superintendent of the Canadian Pacific at London, Ont., has been appointed general superintendent of the Lake Superior division, with headquarters at North Bay.

* * *

G. S. MacKinnon has been appointed assistant master mechanic of Canadian Northern Railway, with supervision of the line from Port Arthur to Prince Albert, office at Winnipeg.

John Becker, for many years head of the Becker-Brainerd Co., of Hyde Park, Mass., and who retired seven years ago, has resumed full charge of this company, as manager and treasurer.

* * *

F. P. Brady, general superintendent of the Lake Superior division of the Canadian Pacific at North Bay, has been appointed general superintendent of the Ontario division, with office at Toronto.

* * *

Warren Chambers, formerly general superintendent for the Fairbanks-Morse Canadian Mfg. Co., Toronto, is now partner in Automatic Products, Ltd., Orillia. Mr. Chambers is superintendent.

* * *

W. W. Cox has retired from the management of Whetman & Barnes, manufacturers of machinists' tools and hardware specialties, St. Catharines, Ont. W. J. Elliot has been appointed to the position.

T. J. DRUMMOND

Elected President of the Montreal Board of Trade for 1908, by acclamation.

* * *

Raymond Lewis has been appointed superintendent of blast furnaces at the Algoma Steel Company, Sault Ste. Marie, Ont. Messrs. R. H. Sanborn and W. C. McKee have been appointed assistants to Mr. Lewis.

* * *

After Feb. 1, the engineering departments of the Niagara Falls Power Co. and of the Canadian Niagara Power Co. will be merged in the operating department. The engineering work of the companies will be in direct charge of R. V. Rose.

* * *

S. H. Reynolds, assistant city engineer, Winnipeg, for past seven years, has resigned. It is learned unofficially that had Mr. Reynolds so desired it, he could have had the position of chief engineer of construction for the city of Winnipeg, a position soon to be created under a by-law lately passed by council.

* * *

W. M. Weigel, St. Louis, Me., has moved to Kingston, Ont., to take charge of the erection and operation of the lead smelter to be erected there, under the supervision of Robert E. Cushman, general manager. It is expected that the plant will be in operation by June 1, 1908.

* * *

J. E. Shantz, founder of the business of J. E. Shantz & Co., Berlin, died at his home in Berlin early in January. This business is a long established one and gradually has been built up and strengthened. The firm now makes boilers and pipe threading and cutting machinery chiefly. Canadian Machinery extends sympathy to the bereaved friends and relatives.

* * *

The following changes have been made in locomotive foremen on the eastern division of the C.P.R.: A. Fortin, appointed to Ottawa, succeeding A. J. Holtby, resigned; F. Howell has been appointed to Quebec, succeeding A. Fortin, transferred; W. J. Hamilton has been appointed to Three Rivers, succeeding F. Howell, transferred; J. A. Carroll has been appointed acting foreman at Outremont, succeeding E. Marshall, transferred to McAdam Jct., N.B.

* * *

Mr. A. H. Van Cleve, who, as engineer of the Niagara Falls Power Co. and Canadian Niagara Power Co. for the past four years, has been in responsible charge of all engineering and construction work, other than electrical, carried on by those companies, will withdraw on February 1 from active supervision of their engineering and construction work, and thereafter will act as consulting engineer of the two companies.

* * *

The following are some changes in locomotive foremen on the C.P.R.: R. K. Oliver, heretofore general foreman McAdam Jct., has been appointed district master mechanic, district 2, Lake Superior division, succeeding A. H. Bilbe, who has resumed his position as locomotive engineer, office, White River, Ont. G. F. Morton, formerly locomotive foreman at Schreiber, Ont., has been appointed assistant foreman at North Bay, Ont. A. E. Hough has been appointed locomotive foreman at Ignace, Ont., vice M. A. Cardell, transferred to Calgary, Alta.

FOUNDRY PRACTICE AND EQUIPMENT

Practical Articles for Canadian Foundrymen and Pattern Makers, and News of Foundrymen's and Allied Associations. Contributions Invited.

PREPARING FOR THE FOUNDRYMEN'S CONVENTION.

On Jan. 23, in the rooms of the Canadian Manufacturers' Association, Toronto, was held a meeting to make preliminary arrangements for the convention of the American Foundrymen's Association, which is to be held in Toronto during the second week of June. The meeting was called by L. L. Anthes, vice-president of the American Foundrymen's Association, and the different organizations and bodies interested in this convention were represented. Owing to illness and important business engagements, several of the men most chiefly interested were not present. These include the chairman of the civic reception committee, the commissioner of industries, and the chairman of the foundrymen's section of the Employers' Association.

Those present were: L. L. Anthes, Toronto Foundry Co.; Dr. Moldenke, secretary of the American Foundrymen's Association; H. M. Lane, secretary of the Foundry Supply Association; C. H. Wheaton, Dodge Manufacturing Co., Toronto; S. H. Chapman, Ontario Wind Engine & Pump Co., Toronto; E. G. E. Holker, Wilkinson Plough Co., Toronto; David Reid Canadian Westinghouse Co., Hamilton, Ont.; W. R. Bears, Detroit Foundry Supply Co., Detroit, Mich.; F. W. Moffat and J. K. Moffat, Moffat Stove Co., Weston; J. P. Murray, Ed. Fleysing, chairman Toronto branch C.M.A.; J. S. McKinnon, chairman reception committee, C.M.A., all three representing the Canadian Manufacturers' Association; J. C. Armer, editor Canadian Machinery.

Dr. Moldenke explained the character of the American Foundrymen's Association and pointed out that its objects were purely educational. He reviewed the history of the association and pointed out the influence it ha l in pointed out the influence it had had in in America and also in other countries. He gave some hints in regard to arranging the programme, and suggested that this year more attention be paid to the educational features of the convention than heretofore. He also gave some hints in regard to preparing the social features.

H. M. Lane then spoke in the interests of the Foundry Supply Association and pointed out that these two associations had worked together during the past two years, and enlarged upon the value of the exhibits made by his association at the convention. He pointed out that the makers of foundry machinery and dealers in foundry supplies at this convention exhibit everything new with the result that very valuable information was obtained by the visiting foundrymen in regard to new equipment and methods of manufacture in their foundries. He said that the supply association would be very pleased to co-operate in any way with the local foundrymen in providing entertainment for the visiting foundrymen.

Mr. Moffat spoke of the valuable information which he had received from the conventions of the American Foundrymen's Association.

Mr. Murray spoke in the interests of the Canadian Manufacturers' Association, as also did Mr. Freysing, both gentlemen pointing out the enthusiastic way in which the Canadian Manufacturers' Association has taken up the matter, and promising the utmost support as far as this association was concerned.

L. L. Anthes read letters from the different large tonnage manufacturers throughout Canada, and from others directly interested, all of which letters showed the interest which Canadian foundrymen are taking in the convention. In these letters the companies all heartily endorsed the invitation which had been extended to the American Foundrymen's Association, and promised their co-operation.

The question of a badge was considered, and Mr. Lane submitted a specimen badge, which he had designed. It differs from the one which was used at the last annual convention in Philadelphia, in that, instead of using numbers, the name of, and the company represented by, the wearer of the badge is printed right on the badge. One section of the badge is also representative of Canada, the design being a beaver, surrounded with a wreath of maple leaves, with Toronto, 1908, on it.

The facilities for the holding of the sessions and for making the exhibits were discussed, and all those present, including Dr. Moldenke and Mr. Lane, were very much taken with the arrangements which could be made at the Toronto Exhibition grounds. Mr. Lane gave some idea of the magnitude of the exhibits which would be made by pointing out that $12,000 was spent by the association last year in the mere placing and arranging of the exhibits, and that altogether over $40,000 was spent by the exhibitors and the association.

Canadian foundrymen should take advantage of this opportunity to make themselves familiar with the recent advances in foundrymen's machinery and supplies, and in the advances in the methods of manufacture, as will be well brought out in the papers to be presented at the convention, and by the large exhibits. It might be pointed out that affiliated with the American Foundrymen's Association are the Brass Founders' Association, and the Associated Foundry Foremen's Association. The Brass Manufacturers' Association has expressed a desire to visit Toronto at the time of the convention.

Any suggestions from any of the foundrymen or foundry foremen throughout Canada which might be of help to the committee, which is now being drawn up, in making arrangements for the convention in June, will be very much appreciated by this committee, of which L. L. Anthes, of the Toronto Foundry Co., will be chairman.

The secretary of the American Foundrymen's Association estimates that if the Canadian foundrymen turn out as is to be expected, there will be fully 2,000 at the convention.

After the meeting there was an adjournment to the St. Charles restaurant for dinner.

ECONOMY IN FOUNDRY.

In a paper read before the Chemical Society in Montreal, the following points were brought out:

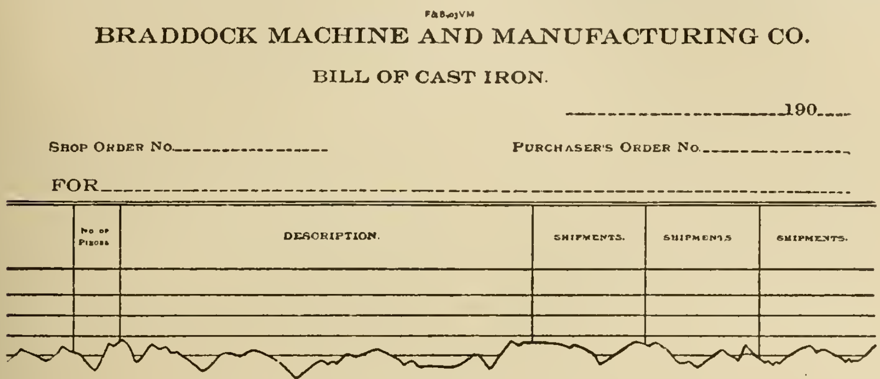
The greatest possibilities of saving in foundry work were in the operation of the cupola, guided by chemical work, and the use of cheaper iron, like scrap. Irons having the same composition would give the same results in the cupola, regardless of where they came from or of their brand. Irons of different compositions could be used in cupola mixture, if properly chemically balanced with some other iron, and the result would be definite. There was no reason for the foundryman to do any rule-of-thumb business, or guessing as to the composition of alleged unfit materials, as by the proper use of the chemical laboratory, definite and complete information could be quickly obtained concerning either raw or finished products.

A Simple Cost System for Jobbing Foundry

System Used by Braddock Foundry and Machine Co.
Paper Read Before Pittsburg Foundrymen's Association.

By J. F. JOHNSON

The cost system which I will outline, adopted by the Braddock Foundry & Machine Co., Braddock, Pa., is one that I consider best suited for the general


F&B-9JVM
BRADDOCK MACHINE AND MANUFACTURING CO.
BILL OF CAST IRON.
____________190___
SHOP ORDER NO.______ PURCHASER'S ORDER NO.______
FOR______

	NO OF PIECES	DESCRIPTION.	SHIPMENTS.	SHIPMENTS	SHIPMENTS.

FIG. 1—SHOP ORDER

jobbing business, as it permits of many variations to meet different conditions in other plants. It can be adapted for either a large or a small shop, shows absolutely what the castings are costing, and can be maintained with the minimum amount of clerical help. Another advantage is that it is not so complicated but that it can be readily understood by an intelligent employe without a knowledge of bookkeeping. No doubt exceptions will be taken to some parts of the system, but as a whole it is as nearly correct as it can be made.

The foundry business is peculiar in a great many respects and is unlike any other line of manufacture on account of the uncertainties regarding product, amount of material and supplies used on any particular job. This makes it a very difficult matter to get an accurate system of cost keeping. The supplies for any job and the apportionment of indirect charges in the different plants are varied and where applicable

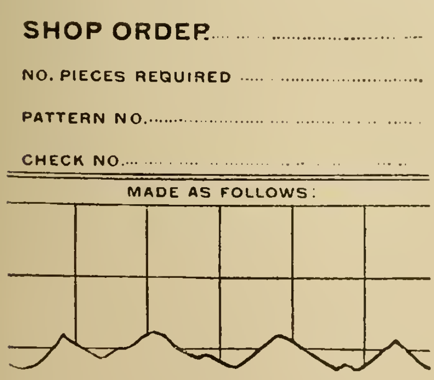

SHOP ORDER......
NO. PIECES REQUIRED ......
PATTERN NO......
CHECK NO......
MADE AS FOLLOWS:

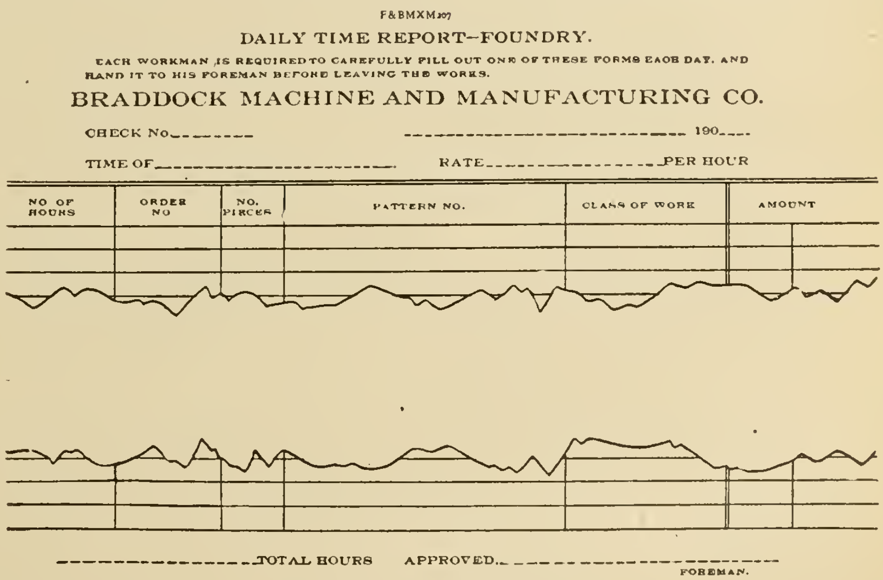
FIG. 2—ORDER FOR MOLDERS

to one class of product they do not apply to another. The system which we have adopted meets all of these obstacles and we believe gives us the true cost of manufacture.

Most foundrymen are satisfied with one or two men acting in the capacity of foundry clerk, timekeeper, stockkeeper, shipping clerk, bookkeeper and probably stenographer. One cannot expect and secure accurate results from such a working force. The men are without doubt overworked and underpaid. Furthermore, an employe who is able to fill all of these positions satisfactorily would not be engaged in such work, as he could get better remuneration for his services elsewhere. From my observations the foundry business is conducted largely on the hit or miss plan. Large contracts are taken every day after a mere perusal of the blue prints and prices are quoted at once, without an examination into details, such as the amount of loss on account of defective work and other unavoidable causes. It appears to be the general impression that foundry costs are secured by averaging the cost of metal, adding the direct labor and about 75 to 100 per cent. for fixed and general charges. This is a great mistake, as I venture to say that no foundry in the country doing a general line of jobbing work can get its indirect expenses as low as 75 per cent. of the direct labor. Instead I believe that these more nearly range from 150 to 200 per cent.

Shop Order.

The system at our plant we believe encompasses practically every item that should be considered in properly computing the cost of manufacture. The first step is to enter the order by giving it a shop order number and issuing shop bills of material for the different departments. This is universal practice and is generally understood. In addition to this shop order shown in Fig. 1, a small card, Fig. 2, is issued to the molder, which contains the number of the shop order, number of pieces required, pattern number and check number. He is thus better able to report his time on the job and incidentally it affords an additional check on the number of pieces made, as he keeps a record on this card of what he has


F&BMXM307
DAILY TIME REPORT—FOUNDRY.
EACH WORKMAN IS REQUIRED TO CAREFULLY FILL OUT ONE OF THESE FORMS EACH DAY, AND HAND IT TO HIS FOREMAN BEFORE LEAVING THE WORKS.
BRADDOCK MACHINE AND MANUFACTURING CO.
CHECK NO______ ____________190___
TIME OF______ RATE______PER HOUR

NO OF HOURS	ORDER NO	NO. PIECES	PATTERN NO.	CLASS OF WORK	AMOUNT	

______TOTAL HOURS APPROVED______
FOREMAN.

FIG 3—DAILY TIME SLIP

molded and hands the same to the foundry clerk each evening. This is also a check against the production of castings in excess of this record.

Daily Time Slip.

A daily time slip, Fig. 3, is filled out by each molder after the completion of his day's work and is handed to the foreman before leaving. On this he enters the number of hours engaged on each pattern, the number of pieces molded, the class of work and other information of value in making up the daily time report. This system has been found more satisfactory than

to have the foundry clerk take the time as it gives the latter a check on the time by comparison with his record when the pattern is changed. Every day

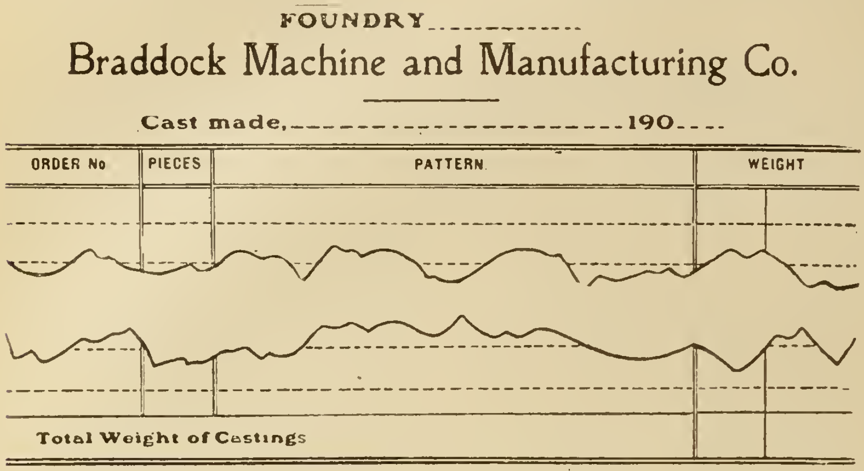


Fig. 4—Report of Daily Casts

a report is made by the foundry clerk of the castings produced, giving the shop order, number of pieces, pattern number, and the weights of the castings, both good and bad. This form is shown in Fig. 4.

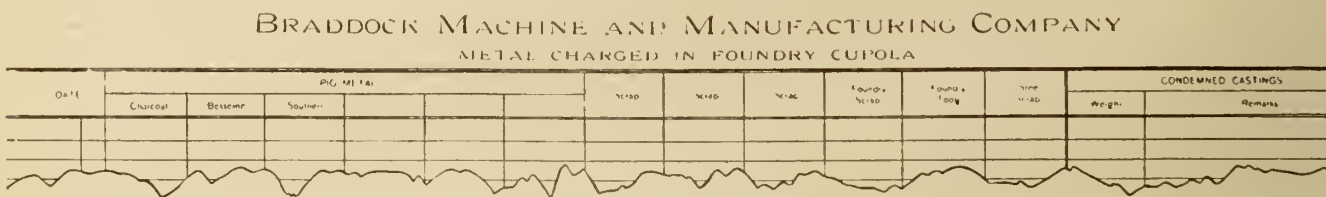


Fig. 5—Report of Metal and Scrap Charged

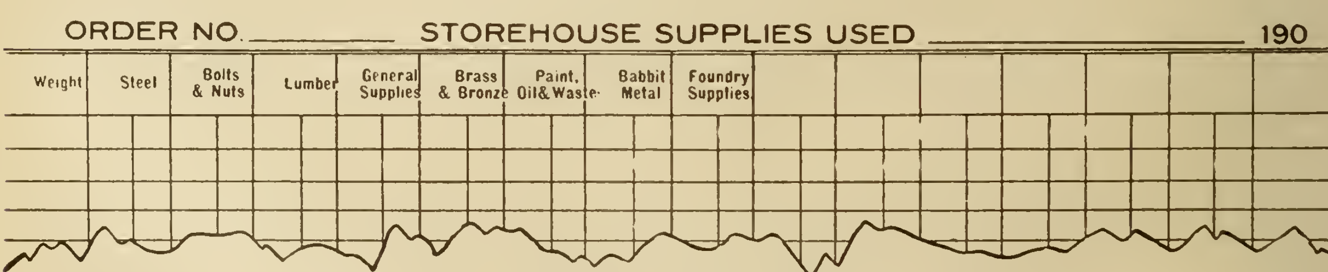


Fig. 6—Order for Storehouse Supplies

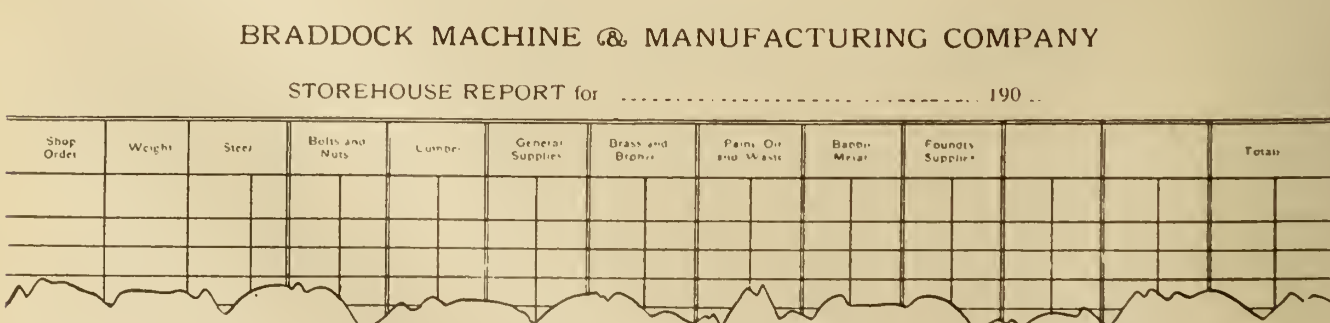


Fig. 7—Storehouse Report

Metal Report.

A record is also made of all the metals charged into the cupola during the month, giving the dates, brands and weights. This can be kept either in book form or on loose sheets. This form is shown in Fig. 5. A store room is also maintained where materials are kept in stock and where they can only be secured by an order from the foreman. A responsible clerk should be in charge, one able to compile a report at the end of each month of all materials used, which should be charged to the proper accounts. True costs cannot be ascertained unless this is done.

Fig. 6 shows a form on which is entered all of the storehouse supplies used on the various orders and the storehouse report is shown in Fig. 7. This contains a column for the shop order, the weight of the material, and such storehouse products as have been used, including steel bolts and nuts, lumber, general supplies, brass and bronze, paints, oil and waste, babbitt metal and foundry supplies. This report is credited every month to the stores' account as well as the various jobs and accounts charged with the same. A periodical inventory is made to compare the actual stock on hand with the book value, which further affords a check on the storekeeper. This may seem unnecessary, but it is found to be a good feature and sometimes prevents theft and careless work.

Distribution of Costs.

As the time slips are received each day in the office after being approved by the foreman, they are entered on a distribution or operating sheet, Fig. 8, which contains columns for the shop order, pattern number, class of work and time required, as well as the various amounts. At the end of the month these sheets are added and the results are shown on the recapitulation sheet, Fig. 9. This contains the columns for the selling value of each order, the weight of the castings, the metal per pound, the cost of direct labor, the ap-

portionment on the weight per pound and the apportionment on direct labor per cent. On the tonnage basis the following factors are taken into consideration : tools, flasks, supplies, cupola fuel, yard labor, cleaning, coremaking and general labor. The apportionment on the direct labor includes oil, waste, etc. fuel for the ovens, taxes, general expenses, interest, insurance, repairs, foreman and clerk, cupola labor, power and

BRADDOCK MACHINE AND MANUFACTURING CO.

FOUNDRY OPERATING LABOR SHEET.

Order No		Description					Order No		Description				
Date	Check No	Mark	Time	Cores	Molding	Labor	Date	Order No	Mark	Time	Cores	Molding	Labor

Fig. 8—Operating Labor Sheet

light, crane labor, teaming expenses, fuel for heating, watchman and storekeeper. The cost of the different pattern numbers can be taken from the sheets at any time after the end of the month's business.

Summary of Products.

Another report which we have found of great value is called a summary of the product and is shown in Fig. 10. It gives the average of the number of molders employed, as well as other help throughout the month, with the total of the product, average pounds per molder per hay, average weight of the piece for the month, and other useful information for the sake of comparison with other months. We are thus enabled to immediately ascertain if our product is varying, and to what extent. This report is self-explanatory and can be compiled very easily.

the practice and average cost per pound. This can be compared with previous months and if operating on the same class of product it keeps a check on the foundry and enables one to ascertain if certain expenses are increasing or decreasing, and in what proportion. I would advise all to keep this cost, as the foreman can be called to account, if necessary.

All fixed charges are apportioned on the productive labor, because time is the factor and these expenses are the same whether the output is large or small and the product is also regulated by the time the floor space is occupied by certain pieces of work. All expenses which are regulated by the output should be apportioned on the weight, because weight is the factor and more expense is incurred for the larger pieces. Some may take exception to this method, but I believe it nearer correct than any other I have seen.

General Accounts.

Under the subdivision of "General Accounts" the following charges are made :

Foundry "A" equipment
Foundry "C" equipment
Machine shop equipment.
Operating expenses
Foundry tools and flasks
General expenses
Insurance
Contracts
Operating labor
Pig iron
Scrap
Electric light and power plant
Repairs
Store supplies
Taxes
Pattern shop equipment
Blacksmith shop equipment
Teaming expenses
Improvements

General Expenses.

The "General Expense" includes the following :

Salaries of officers, clerks, etc.
Stationery and printing
Furniture and fixtures
Advertising
Medical attendance
Office expenses

Operating Expenses.

Operating labor, foundry "C" :
Foreman and clerk
Molding and casting
Coremaking
Cupola and furnace labor
Crane labor
General labor
Cleaning and shipping

Operating expenses, foundry "C" :
Tools
Oils, waste, etc.
Flasks.
Supplies
Fuel for cupola
Fuel for ovens
Fuel for heating

Repairs.

Repairs, foundry "C" :
Buildings, etc.
Cupola and ovens
Cranes
Ladles, scales and pit
Blowers and motor
Elevators
Tumbling barrel and sifter
Air furnace
Molding machine
Rip saw and connections

Pattern shop operating labor :
Pattern labor
Checking patterns
Repairing patterns
General labor

Pattern shop repairs :
Saws, planers and lathe
Miscellaneous

Pattern shop operating expenses :
Tools
Supplies
Fuel

Electric light and power plant :
Operating labor
Tools
Oils, waste, etc.
Repairs, including labor and material
Electric current purchased
Lamps, globes, carbons, etc.

BRADDOCK MACHINE AND MANUFACTURING CO.

SUMMARY OF FOUNDRY PRODUCT. 190

Order No	Selling Value		Weight of Castings	Metal c lb	Direct Labor	Apportionment on Weight. c lb	Apportionment on Direct Labor. Per Cent	Total Cost.
	Per lb	Amount.						

Fig. 9—Recapitulation Sheet

We now come to the final steps which are arrived at after the books are closed and all expenses determined. It is nothing more nor less than the final recapitulation of the foundry product, showing the costs of the different items as obtained from our books, and as these figures are actual they are bound to be correct. This sheet shows the actual cost of the foundry product for the month, also other items, as well as

SUMMARY OF FOUNDRY PRODUCT.......... .... 190 ......

Average Number Molders during Month	....
Average Number Men during Month	....
Product for Month	........................Lbs.
Number Pieces for Month	....
	AVERAGE.
Pounds per Molder per Day	....
Pieces per Molder per day	....
Pounds per Man per Day	....
Pieces per Man per Day	....
Average Weight of Piece for month	........................Lbs.
Average Molder's Wages per Day	....
Average Molder's Wages per Lb. Product...	$........................
	........................Cts. Lb.

Fig. 10—Summary of Foundry Products.

Repetition Patterns; Parting Line and Draft Considered

Continuation of Article Appearing in January Issue; Taking Up Consideration of Parting Line and Allowance for Draft.

By E. A. BERRY

Location of the Parting Line.

The location of the parting line, both with reference to the parting itself, and with reference to the edges of the flask, is highly important, and the judgment used in its selection may make the whole difference between success and failure in producing the molds.

In locating it we should be governed by these rules:

A. Avoid steep inclines in the abutting surfaces of the drag and cope. Always keep these surfaces as nearly square to the line of lift as possible.

B. Avoid unsupported projections of sand, particularly in the cope. Avoid hanging pockets of sand in the cope.

C. Make the draw in lifting the cope as small as possible.

D. Where a draw in the cope is unavoidable, endeavor to keep it up within the flask so that the latter will support it.

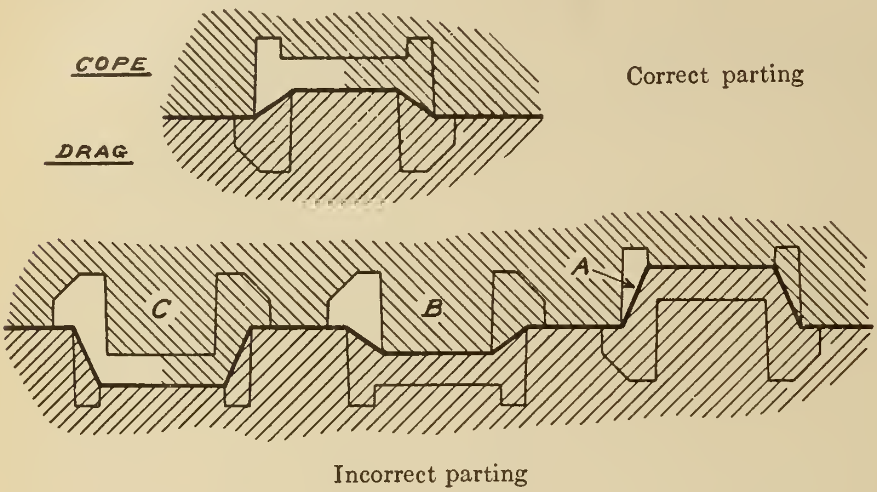


Fig. 15.—Avoidance of Steep Inclines in Parting Surface and of Hanging Pockets of Sand.

E. When practicable, avoid a parting surface which intersects a face of the casting. Give the preference to a parting which forms a continuation of a face even if a rounded corner has to be sacrificed.

F. If a mold board is used, avoid exposed joints between it and the pattern.

Following these rules the first of the partings shown in Fig. 15 to 19 inclusive, are the ones to be preferred in each case. Partings similar to those shown in Fig. 20 to 24 inclusive should be used only if necessary and of the two partings shown in Fig. 25, the first is to be preferred.

Fig. 15 illustrates the avoidance of the steep incline at A and of the hanging pockets of sand at B and C. Fig. 16 illustrates the avoidance of the unsupported projections of sand at D and of the hanging pocket of sand at E and F. Fig. 17 and 18 illustrate again the avoidance of hanging pockets of sand at G, H, J and K, and Fig. 15 to 19 inclusive illustrate the features of keeping the draw in the cope as small as possible, and of keeping it up inside of the flask.

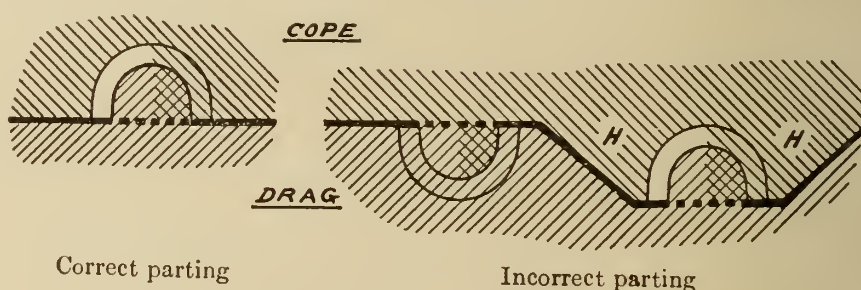


Fig. 17.—Casting in Cope.

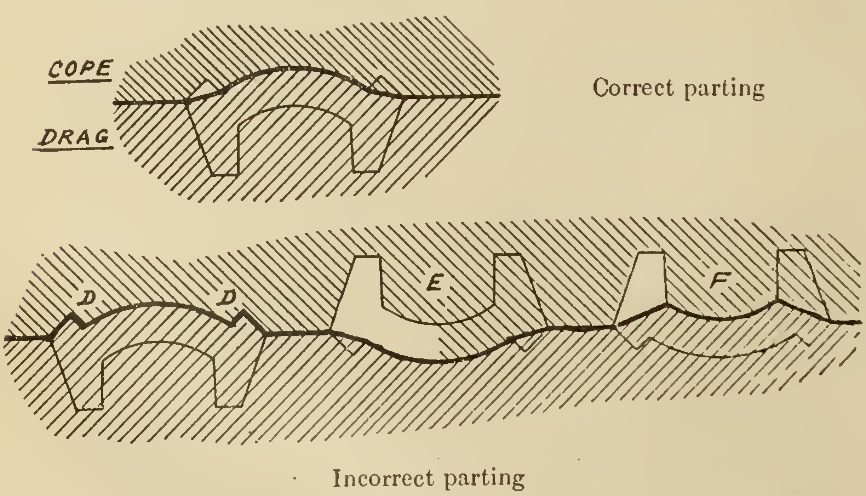


Fig. 16.—Avoidance of Unsupported Projections of Sand and of Hanging Pockets of Sand.

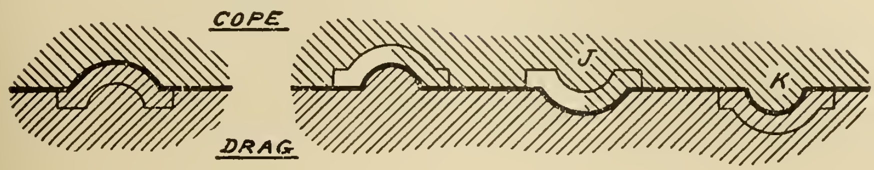
It is interesting to note that the application of these rules results, in different cases, in locating the casting in each of the three possible positions in the mold, namely, entirely within the cope, as in Fig. 17; partially in the cope and partially in the drag as in Fig. 18, and entirely in the drag as in Fig. 19.

Fillets and rounded corners are such excellent things—in their proper places—and their importance has been written about and talked of so much that we are sometimes led into calling for them in places where they are of no help to the casting, and really become very objectionable on the pattern.

If it was absolutely necessary to round all the corners of a pattern it would have to be mounted as shown in Fig. 20, adding extra expense to the making of the pattern, and making it necessary to exercise constant vigilance to keep the flask pins true.

If it were permissible for the corners

B and C of Fig. 20 and 21 to be square the pattern might be mounted as shown in Fig. 21. This would still permit of a round at A. If a fillet was required at C of Fig. 21, it would run out to a feather edge at the upper surface of the plate, and if a smooth and true

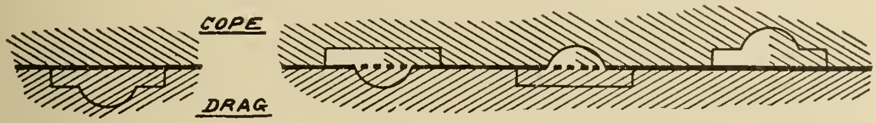


Correct parting

Incorrect parting

Fig. 18.—Casting Partially in Drag and Partially in Cope.

surface was required at that point of the casting, the pattern would have to be set into the plate as in Fig. 22. The objection to this fillet applies only to "plate" patterns and not to "open" cardings. If carded "open," the mold and pattern would appear as in Fig. 23. The objection to the double rounded



Correct parting

Incorrect parting

Fig. 19.—Casting in Drag.

corners, however, holds for the "open" carding as well as for the plate, as the cope, instead of being flat, would have to be brought down as shown in Fig. 24.

Whenever a rounded corner involves the shifting of the parting line from its

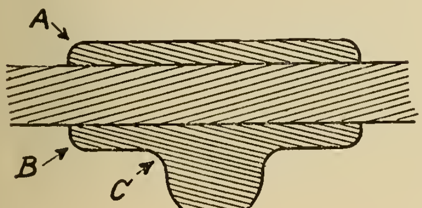


Fig. 20.—Plate Patterns with all Corners Rounded.

best position, an effort should always be made to modify the design so as to permit of a square corner at that point. If the trouble is feared from the chilling of the corner, it is well to remember that in hand molding this chilling is more frequently due to wetting the mold than to the actual sharpness of the corner. In machine molding, using well made patterns with ample draft, there should be no occasion whatever for wetting the edges of the mold.

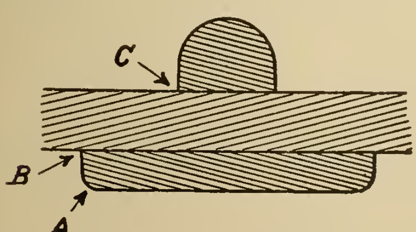


Fig. 21—Plate Pattern with some Corners Rounded.

In avoiding objectionable projections or hanging pockets of sand, it will be of assistance to bear in mind that the mold board corresponds exactly to the cope, and that all irregularities in one will be reproduced in the other. It is, therefore, always desirable to keep the mold board as free from such irregularities as may be consistent with the other requirements which have to be met.

In the case of the pattern shown in Fig. 25, it makes little difference, as regards the draw, which side is put in

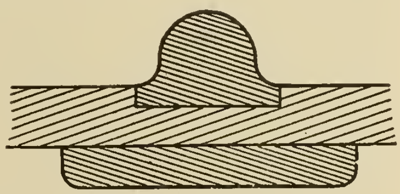
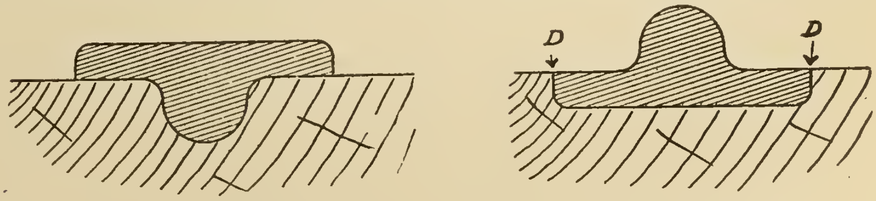


Fig. 22.—Pattern Inserted in Plate to Provide Good Fillets.

the cope. But of the two positions shown the first is to be preferred, as it avoids the exposed joint at D. Such a joint requires careful fitting when the



Correct parting

Incorrect parting

Fig. 25. Patterns let into Molding Boa rd.

mold board is made, and frequent repairs are necessary to maintain its accuracy. By placing the pattern in the first position it covers the recess in the mold board entirely. In this case the recess merely becomes a clearance opening, and no fit is necessary, except perhaps at the bottom, in order to support the pattern and to prevent it from springing. The first position has the further advantage of requiring the removal of less material from the board. The carving of a mold board is a tedious and expensive hand operation at the

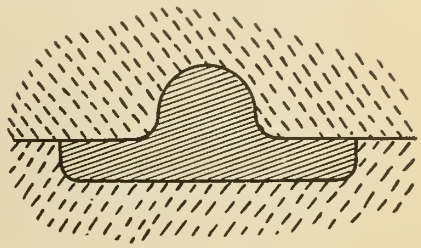


Fig. 23.—Fillets in "Open" Carded Patterns.

best, and every method of reducing this expense is well worth considering.

In the foregoing we have considered molding conditions but not casting conditions. A description of the latter would be beyond the scope of this paper, but attention is called to the fact that they may at times necessitate a departure from the arrangement which would be the most desirable if only the making of the mold had to be reckoned with.

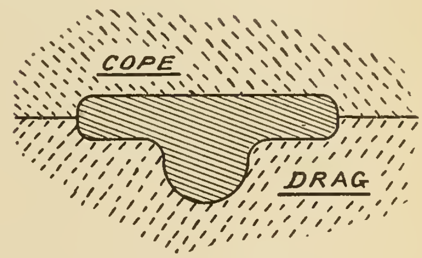


Fig. 24.—"Open" Carded Patterns with all Corners Rounded.

Allowances for Draft.

It is necessary that draft toward the parting line be provided in all cases. A smaller draft is permissible when the pattern is lifted from the sand, as in the case of "reversible plate" patterns, "split" patterns, and the drag side of all other patterns, than when the mold is lifted off of the pattern, as in the cope-half of all except "reversible plate" patterns and "split" patterns.

If the draw is shallow, it is usually desirable to express the draft in degrees, but if the draw is deep, it is better to give dimensions for the top and bottom of the taper. In the first case

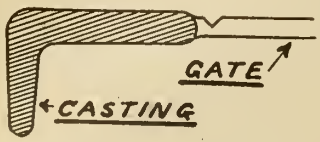


Fig. 26.—Nicked Gate.

a slight error in measuring the angle would not sensibly affect the dimensions of the piece, while a slight error in the dimensions might change the draft very considerably. In the second case the conditions are exactly reversed.

For those portions of a pattern which are drawn from the sand, the draft should never be less than 1 degree on a side, or 0.02 inch per inch, on a side. If possible it should be about 2 degrees on a side or 0.03 inch to 0.04 inch per inch on a side.

For those portions of a pattern from which the cope has to be lifted, the draft should never be less than 1½ degrees on a side, or 0.03 inch per inch on a side. If possible it should be about 3 degrees on a side, or 0.05 inch per inch on a side.

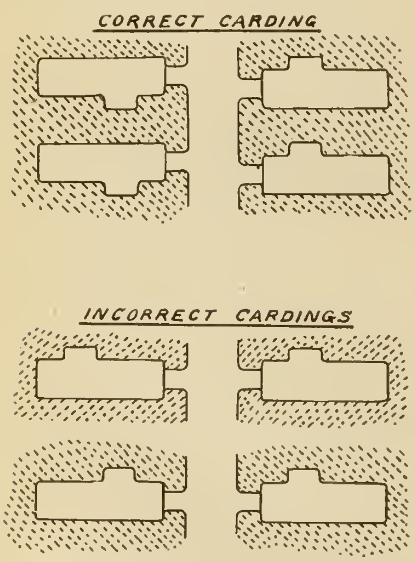


Fig. 27.—Effect of Carding on Uniformity of Cardings.

CANADIAN RAILWAY CLUB MEETS

The regular meeting of the Canadian Railway Club, Montreal, was held on Tuesday, January 7, when a paper was read by George A. Damon, managing engineer the Arnoldi Co., Chicago, entitled "Arrangement of Railroad Shops."

The sixth annual dinner of the Canadian Railway Club, Montreal, was held at the Windsor Hotel on Jan. 24. The toasts were: The King, The Railways, Our Guests, and The Railway Supply Man.

Description of the Manufacture of Electric Wire

The enlarged works of the Eugene F. Phillips Electrical Works, Limited, illustrating and describing wire making processes carried on there.

With the development of electrical power in Canada came an increased demand for electrical supplies. Some eighteen years ago the company, Eugene F. Phillips Electrical Works, Limited, started business in Canada, on a comparatively small scale. A factory containing about 17,000 sq. ft. was erected on the canal bank and since the opening of the plant the growth has been rapid and for 1908 prospects look very bright for the electrical wire business. The first building was completed in 1889 and in 1899 an addition was made necessary and the floor space was increased to 22,000 sq. ft. In 1904 it was decided to move their works to Mile End, Montreal, where the plant could be enlarged to suit the growing requirements of the trade. A plant was completed in that year having a floor area of 53,000 sq. ft. Another addition, a three storey building 60 ft. x 120 ft., has just been completed, bringing the hardens the wire. It is then passed through an annealing furnace. The wire is rolled on steel drums and annealed in large iron pots. After annealing, the wire is given an acid bath, and then one in hot water. Four large vats furnish the equipment for this purpose. If cables are required, the wire is then passed to the cable room where it is wound on reels for the strand machine. The number of reels used on the strand machine depends on the specifications of the cable. Cables are wound concentrically with 7, 19, 37 or 61 strands, as required. Fig. 1 shows a corner of the cable room with two cable machines.

In a small compartment is a furnace and equipment for tinned wire which is made on order. For tinning the wire passes through the acid solution, the furnace, and is dried in asbestos as it comes from the furnace.

The wire for electric machines and wiring is drawn on one of five types of

Fig. 1.—Cable Room. Eugene Phillips Electrical Works.

area of floor space available up to 75,000 sq. ft.

The plant is adjacent to the C.P.R. tracks and a spur line runs into the electrical works, giving the company good transportation facilities. The buildings are large, airy and well lighted and well protected in case of fire. Each department has its own motor and the work and departments are so arranged that the work moves forward progressively through the different machines and processes until it reaches the shipping department.

How the Wire is Made.

The material is brought to the works in different size rods and the first operation is to draw it to the required size on wire blocks. This operation

wire drawing machines. Each machine is specially suited to the different sizes. The machine for the very fine wire draws twelve sizes at once, and at a greater speed than the others. The machines deliver 1,000 feet of wire per minute.

Covering and Insulating Wire.

The first floor of the recent addition is used for braiding and insulating the line wires. The wire is double or triple braided, dipped and saturated with an insulating compound and then it is given a second finishing and polishing coat. The wire is then passed through polishing heads to give a smooth, hard finish, and coiled or reeled for shipment.

Another wire is braided with cotton

and covered with asbestos point, which forms a slow-burning, weatherproof covering.

Winding Room.

In Fig. 2 is shown a corner of the winding room where the wire is wound with cotton, either single or double. The silk covering adds .002 inch to the diameter, while special silk covering adds only .0015 inch. Cotton covering adds .003 to .004 inch, depending on the size of the wire. For electrical machinery, dynamos or motors, the wire is covered with asbestos paper and covered with a single cotton insulation.

The fine wire for lamp cord usually consists of No. 30 wire, wound with cotton insulated with a coat of rubber. It is then braided and vulcanized and twisted for lamp cord. The braiding is either polished cotton or silk.

Machinery is being added to manufacture telephone cables and when this is installed the equipment of the Eugene F. Phillips Electrical Works, Limited, will be most complete.

The business is under the direction of George H. Olney. The manufacturing is in charge of two superintendents with capable foremen in each department. The company realize the importance of having a good system of checking their work.

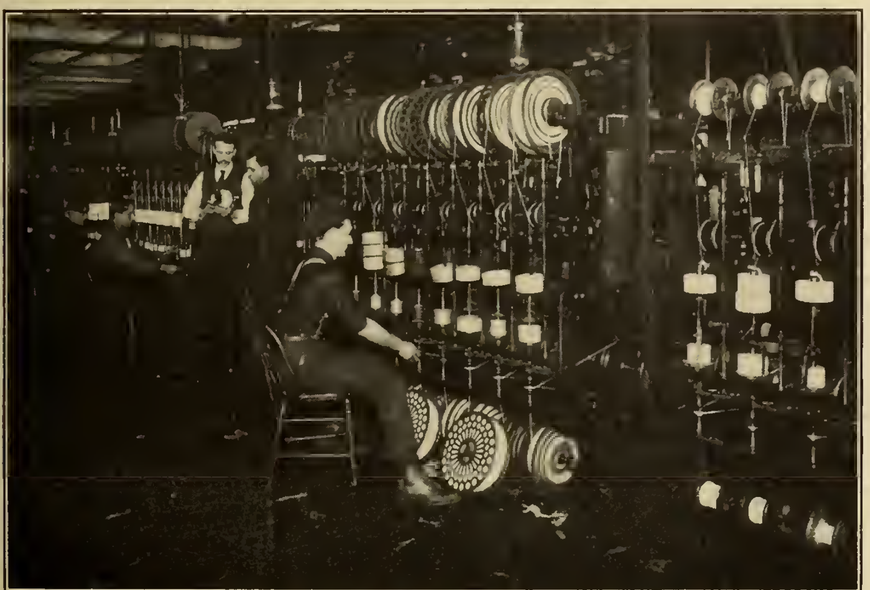


Fig. 2.—Corner of Winding Room, Eugene Phillips Electrical Works.

EXHIBITORS' ASSOCIATION MEETS.

On Jan. 9, in Toronto, there was a meeting of the Canadian Engineers' Exhibitors' Association, which was formed last August at the convention of the Canadian Association of Stationary Engineers at Guelph. Ways and means of making a good exhibit of engineers' supplies at the next annual convention of the association, which is to be held at Windsor, were discussed at length. The secretary, Earle F. Heatherington, Goldie & McCulloch Co., assured Canadian Machinery that the exhibit would be a splendid one. In former years this feature has been neglected, and, consequently, has been of little value to the engineers or exhibitors. This year, however, the members of the association can count on something which will be of value to them.

J. T. Carland, the Tunkenheimer Co., president, occupied the chair.

CREATING A DEMAND.

During the last few years the importance of education in advertising is being very fully realized. On every side there is evidence of it. A large number of good catalogues now contain information of such value that they can be used as text books on the specific subjects with which they deal. Advertising in the trade and technical press has a tendency towards the educative.

But what is chiefly interesting is the educative campaigns which have been conducted with an idea of creating or increasing the demand for a certain product. In the November issue of Selling Magazine, Walter B. Snow, late publicity manager for B. F. Sturtevant, now publicity engineer in Boston, tells of the educative campaign he carried on to create a lively demand for mechanical draft apparatus. He tells about the veritable text book he got up on mechanical and natural draft, of the articles he wrote for the mechanical papers, and of the lectures he gave on the subject in universities and other places. His article is most interesting and instructive.

Another educative campaign, which has been carried on with great persistence and with good results, is with regard to the individual motor drive question. The big electric companies have boomed that with very great success.

D. W. ROBB, AS A MANUFACTURER AND BUSINESS MAN.

David W. Robb, president and managing director of the Robb Engineering Company of Amherst and the Robb-Mumford Boiler Company of Boston, was born at Amherst 51 years ago. His father was the late Alex. Robb, founder of the Robb Engineering Company, and his mother was Eveline Logan, a member of the well known Cumberland county family of that name. David Robb received his early education at the county academy at Amherst, and numbers among his classmates, although they were somewhat his seniors in age, Hon. W. T. Pipes, attorney-general of Nova Scotia; W. B. Ross, K.C., and the late J. T. Bulmer, barrister, of Halifax.

In the year 1875 Mr. Robb, with his brother, the late Frederick B. Robb, assumed the management of the business of their father, who was compelled to give up active work through ill health. Since that time the growth of the business has been rapid, developing from a small stove foundry and machine shop to the large works at Amherst and South Framingham, Mass., the products of which may be found in almost every city and town in Canada, the United States, and many foreign countries.

D. W. Robb is a good example of the business engineer. His early experience and education were in the mechanical engineering line, the commercial departments of the business having been conducted with such ability by his late brother, who had an equal share in the development of the Robb Engineering Works up to the time of his death, in 1887.

Since that time the responsibility of the business departments has developed upon D. W. Robb, and although he states that he finds much greater ease and pleasure in the mechanical and constructive problems which form so important a part of his business than in the purely commercial details, the great business reputation which he built up for his company in late years is ample enough evidence of his executive ability. The good reputation sustained by machinery turned out from his shop speaks in no small voice for the mechanical knowledge and experience with which Mr. Robb has equipped himself.

CANADIAN MACHINERY and Manufacturing News

A monthly newspaper devoted to machinery and manufacturing interests, mechanical and electrical trades, the foundry, technical progress, construction and improvement, and to all users of power developed from steam, gas, electricity, compressed air and water in Canada.

The MacLean Publishing Company, Limited

JOHN BAYNE MACLEAN - - President
W. L. EDMONDS - - - Vice-President
H. V. TYRRELL - - - Business Manager
J. C. ARMER, B.A.Sc., - Managing Editor

OFFICES:

CANADA
MONTREAL - 232 McGill Street, Phone Main 1255
TORONTO - 10 Front Street East, Phone Main 2701
WINNIPEG, 511 Union Bank Building, Phone 3726, F. R. Munro
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SUBSCRIPTION RATE.

Canada, United States, $1.00, Great Britain, Australia and other colonies 4s. 6d., per year; other countries, $1.50. Advertising rates on request.

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Vol. IV. FEBRUARY, 1908 No. 2.

CONTENTS

MANUFACTURERS HAVE REASON FOR OPTIMISM

In spite of the scarcity of funds just now, there is good reason for optimism among the manufacturers and others. It is not easy to eliminate the salient fact that probably 50 millions will be spent in Canada in railroad construction during 1908, as outlined in another column. Ninety-five per cent. of these funds have already been secured abroad or will come by way of London. Will not the expenditure of this sum mean something?

A large Canadian manufacturer of machine tools and other lines, a couple of weeks ago remarked to Canadian Machinery: "I have a good mind to place an order for some machinery I need around the shops, and show them there is one at least who is not afraid." Where other manufacturers have been running on short hours and also in some cases with a cut in wages, he has run full time, and no cut in pay.

If he has had the courage of his convictions and placed that order, then he had done his share towards restoring confidence, and thus bringing things back to their normal conditions. Think of the development work which is to be done in Canada; think of the high esteem in which Canadian securities are held in London and other European centres; think of the gradual reduction of the Bank of England rate from 7 per cent. to 4 per cent. during the past month; then do you not think with us, that, if all the Canadian manufacturers went over their plants and placed orders for machinery or equipment, which, under the normal conditions of a few months ago, they would need, and, in some cases need badly, there would be started a reaction in the proper direction?

Of the many manufacturers interviewed by Canadian Machinery during the past month, there were few, very few, who were not optimistic as regards the return of better days in the early spring. The best way for a manufacturer to express his convictions is by doing some necessary buying himself, and not put it off until the work in his shops practically forces him to do it. It would be a little bit of speculating on his part which would be of immense value to the country. And if a number of manufacturers did this, the speculation would be slight, and conditions would receive a material boost back to normal conditions.

WILL SPEND FIFTY MILLIONS IN RAILWAYS.

A factor which differentiates Canada from the United States is the railway development that must continue and the ability of our large railroad companies to secure funds abroad. The Canadian Pacific Railway will obtain in the next six months $24,336,000. of which at least eighty per cent. will come from abroad. The Canadian Northern is pursuing a conservative policy as regards extensions, but will be able to secure more funds for equipment and improvements during the coming year. The Grand Trunk Pacific secured over $30,000,000, and has still available of this amount some $18,000,000 for further construction work. The Government must secure funds from time to time for its sections of the Transcontinental line and now that wages have had a very material drop, the contractors will be showing more energy. It is not unlikely that fifty million dollars will be spent on railway works during the coming year in Canada. Mr. Charles M. Hays, president of the Grand Trunk Pacific, writes in reply to our request for an outline of the progress of the G.T.P. as follows:

"There is at present under contract, the construction of which is in charge of this company, 994 miles of railway which embraces the prairie section of Winnipeg to Edmonton, and also includes the Lake Superior branch from Fort William northerly to the junction with the Eastern Division. There is also under contract the construction of which is in charge of the commissioners of the National Transcontinental Railway, about 840 miles, or a total of 1,844 miles, the construction work on which is now in progress."

The portion of the eastern division, the construction of which is in charge of the Commissioners of the Transcontinental Railway, now under contract, is 859 miles. By the opening of the season of 1908, it is estimated that

thirty-five million dollars will have been spent on the entire construction work on both divisions. The sum which remains to be spent is about one hundred and twenty-five million. In order that the work shall be completed by the time specified, New Year's Day, 1912, an expenditure of thirty million dollars a year by the Transcontinental Commission and the Grand Trunk Pacific will be necessary.

Considering the foregoing facts, there surely is some reason for optimism concerning business for the coming year.

IS IT WISE POLICY?

When a machine tool maker specializes in one line of tools, he can cut down the manufacturing cost to a minimum. Because of the large quantity of duplicate work, he can use special machinery and jigs to great advantage. Thus, wherever the market is large enough, specialization is the best policy. In Canada, specialization has not been carried on to any great extent, although there are manufacturers who believe the Canadian market quite large enough to build up a specialized tool business, and these same makers have started to test their conviction. But there has to be more or less specialization under any circumstances, and practically all the machine tool builders in Canada specialize to an extent.

Under these conditions, suppose some firm or corporation were on the market for a machine tool, which was more or less of a special one. One firm had built tools of practically the same type before, and, therefore, could build that tool much more cheaply than a firm which had not built a similar tool before. They would probably have a good many patterns and jigs which could be used over again, besides the experience. The other firm, who have been devoting their attention along a somewhat different line, make a bid for this tool at a price which will cut the first firm out, although they are sure of dropping a tidy sum in the transaction. That is, the second firm take the contract merely to keep it from the first firm, paying, perhaps, dearly for the satisfaction.

Now the question, is that a wise policy? A great deal could be said for and against, but here is a suggestion, which shows up the desirability of a different policy. Why should not both firms stick a little more closely to the special lines, or if they have no special lines, choose them? The reputation of the maker could be built up on his special line of tools; and then he would probably find it very much to his disadvantage to attempt anything outside his own line. Where these lines made by the different builders interlapped there could be strong competition on a fairly common basis, since only those builders making a specialty of a tool would be after the contract.

As a result of this policy there would be legitimate profit; and each builder being more or less of a specialist, could build much better tools than a builder who dissipated his efforts here and there and everywhere.

SYSTEM IN MANUFACTURING.

One of the features of Canadian Machinery has been the articles on systems in manufacturing plants which have appeared from time to time. The reason for our giving so much space to manufacturing, machine shop, tool room and foundry systems, is that in a new country like Canada, where new manufacturies are springing up and old ones are being enlarged, there is great demand for information along these lines. These articles have been much appreciated by our readers, and during the past month, especially, have we realized the extent of the interest taken in them, when we received numerous inquiries concerning the article on system in a machine tool plant, published in the January issue.

More and more are manufacturers realizing the importance of maintaining a good system in their plants; but there are still some who do not appreciate the importance of systematizing their manufacture. Only the other day a large Canadian manufacturer said to us: "I wish a certain one or two of our competitors would install good cost systems. I doubt whether they would tender as low as they do if they knew exactly what their product cost them."

There is just the point. Every manufacturer should have an exact knowledge of what each machine cost him, and how that cost is made up. Without such data he is working in the dark.

But too much system is worse than no system. Not only does too elaborate a system run the over head expenses up so high as to materially reduce the profits, but it also interferes with the rapidity of manufacture. There are manufacturing plants in Canada with systems so elaborate and cumbersome that there is great difficulty in meeting competition, because of the enormous overhead expenses. General dissatisfaction also exists around the works because of the "red tape"; and dissatisfaction in a shop is like friction in a bearing.

So that a system which would be very efficient in one shop, might be altogether too cumbersome for some other shop. And thus it is that descriptions of systems used in different shops, large and small, are of great value. Probably no one of these could be applied by any of our readers without any change, but the hints and ideas which can be obtained from them are invaluable.

STOP ALL LEAKS, LITTLE AND BIG.

During the last few years the development in the industrial field has gone ahead so rapidly that manufacturers have had their work cut out for them filling orders. All their spare energy, spare thought and spare capital were taken up in making extensions, in order that they could fill orders.

Just now things are quiet, and the manufacturer has a chance to do some general thinking. Now is his opportunity to go over his plant thoroughly to discover how he can improve his product or cut down manufacturing costs. Perhaps the machine shop, foundry or tool room needs a good simple system. Perhaps there is an out-of-date machine doing work which could be done much more cheaply on some modern tool, the saving being quite sufficient to pay the interest on the investment many times over. Perhaps the manufacturer may be doing a lot of duplicate work, which could be much more cheaply done on an automatic machine. Perhaps the power equipment is old and inefficient. By going into the cost of power generation and transmission he finds he could save a good deal of money by putting in new equipment. There may be a thousand and one ways in which little leaks could be cut off.

It should be impressed on manufacturers that orders will not be thrown at them for a little while yet, and they will have to get out and hustle for any they get. The manufacturer who has equipment with which he can manufacture at the very lowest cost, has a very decided advantage over those who are not similarly situated. A few months ago ability to turn out large quantities was the trump card, but just now and for some time to come, low manufacturing cost will be the trump card.

Now is the time to equip one's plant for close manufacturing. Now is the time to cut out all leaks, big and little.

INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News.

Machine Shop and Foundry News.

R. Muzun, Morden, Man., has leased the Morden Machine Works.

Mr. Frank Stanfield has purchased the plant of the Truro Foundry & Machine Co., Truro, N.S.

J. W. Hunter, machinist, has opened a new general manufacturing and repair machine shop at Kingston, Ont.

Witt's Foundry, Norwich, Ont., was destroyed by fire a few days ago. The loss included much valuable machinery.

Work has commenced on the marine shops to be erected at Fort William, Ont., for the Great Lakes Dredging Co.

Keough & Trotter, Chatham, Ont., will erect a machine shop addition to their present works. Dimensions, 100x40 feet.

During the slack time the Midland Engine Works, Midland, are moving their machinery into their new buildings.

The Dominion Car & Transmission Co., will erect new car shops and freight shed at Hamilton, Ont., this spring.

Brandon Machine Works Co., Ltd., Brandon, Man., are asking Canadian steam engine manufacturers for their catalogues.

The Ottawa Steel Castings Co., Limited, has just completed a new cement block foundry, 67 feet by 142 feet, with steel framework.

The Warner-Gibson Co, are starting a new factory at Welland, Ont. They will manufacture agricultural implements of various kinds.

E. C. Atkins & Co., saw manufacturers, have moved their Toronto office to Hamilton, where their Canadian factory is now being constructed.

The Canadian Iron & Foundry Co., will build a new foundry at Fort William. The company has purchased thirty acres on the Kaministikwia river.

The Standard Implement Co. will be started shortly in London, Ont., with a capital of $60,000, and will make farm machinery. The plant will be built in the spring.

The Chaudiere Foundry & Machine Shop, Duke street, Ottawa, have closed down for the present, due to the fact that the men went on strike when a cut in wages was announced.

The Forwell Foundry Co., Berlin, has been practically closed down for the present. Soil pipe is the chief product, and the recent cutting of prices told pretty badly on the financial condition of the company.

George E. Mills, Hamilton, Ont., has secured the contract of building another large addition to the Hamilton Steel and Iron Company's blast furnace plant, of Hamilton, Ont. It is for a $5,000 brick machine building.

A manufacturing concern is negotiating with Ottawa concerning the establishment of malleable iron foundry and machine shop. There would be 100 men employed. A committee, consisting of the mayor and others, will take up the matter.

A report from Prince Albert, Sask., announces that a United States firm have made a definite proposition to that town for the establishment of a $100,000 factory there. The municipality is also negotiating with two companies with a view to the establishment of foundries.

The American Auto-Engine Co. have recently opened up a machine shop in Montreal. Considerable up-to-date machinery has already been installed, and more will be put in later on. They are manufacturing marine and stationary gas and gasolene engines, and are also making a specialty of fine repair work.

The Assessment Commissioner of Toronto has recommended that the city lease to the Don Foundry Co. 120 feet of land at Ashbridge's Marsh, at $150 per year and taxes for twenty-one years. On this site the Don Foundry Co. will build a new foundry.

Owing to the scarcity of pig iron the steel plant at the Canadian Soo will close down for an indefinite period. Nearly the whole staff of workmen will be kept on, however, making repairs and alterations that are deemed necessary. The blast furnaces will be kept working at their fullest capacity.

The plant, premises and equipment lately owned and operated by the Huntsville Foundry and Machine Co., has just been purchased from the Marsh Estate by the Huntsville Engine Works Co., who have had it overhauled and placed in first-class condition for the manufacture and repair of all classes of mill, steamboat and other machinery.

Chas. H. White, manager of the London Rolling Mills Co., says that concern will presently be running full strength, though it has been almost completely closed down for several weeks. Mr. White says he is getting many more inquiries, which is taken as an indication that conditions are improving, and he confidently looks for better times in the near future. The re-opening of the rolling mills will have a decidedly beneficial effect on the local industrial situation, for since the shut-down only eleven out a staff of 225 men have been at work.

Electric Power and Transmission.

The electric light plant, Granby, Que., will be extended.

Okotoks, Alta., is considering taking over the local electric light plant.

The Hastings Telephone Co. will extend their line to Roslin, Ont.

Dorchester, N.B., has installed a system of incandescent lighting at a cost of $10,000.

Cook & Hermon are offering to sell their electric plant at Claresholm, Ont., to the municipality.

The fire and light committee, Listowel, Ont., is considering the installation of an electric lighting plant.

The Yarmouth Electric Co. is being formed in Yarmouth, N.S, to take over the stock and plant of the Street Railway Co.

W. J. Broley, Battleford, Sask., has been awarded the contract for the erection of the proposed power plant in that city.

The Londonderry Iron & Mining Co., Londonderry, N.S., purpose developing power at Nixteaux Falls, to operate their mines.

A private company are contemplating the installation of an electric light plant for both street and house lighting at Vegreville, Ont.

Two electric pumps will be required in connection with the installation of a water system at Dominion, N.S. The estimated cost is $26,000.

The Shawinigan Water & Power Co., Montreal, are installing two sets 1,500 k.w. 30 to 60 cycle three-phase 600 r.p.m. Crocker Wheeler generators.

Messrs. Ross & Holgate, Montreal, are preparing plans for an electric light and power plant for Sherbrooke, Que., F. J. Griffith is city treasurer.

The ratepayers of Port Hope, Ont., voted favorably on a by-law authorizing the town council to proceed with the erection of municipal lighting plant.

The city council, Port Arthur, Ont., have authorized the purchase of a 250 h.p. motor generator, at a cost of $8,000, for additional street railway power.

The city council, Port Arthur, Ont., are considering the proposition of the Kaministiqua Power Co., to supply 200 h.p. electric energy at $25 per horse power per year.

The contract for the construction of the plant of the Minnedosa Power Co., Minnedosa, Man., has been awarded to the Hydro-Electrical Construction Co., of Toronto, at $80,000.

Messrs. Steinhoff & Gordon, owners of the electric light plant at Tweed, Ont., have sold the entire plant to J. P. Kissack. Improvements will be made to the plant at once.

The ratepayers of Gananoque, Ont., voted favorably on a by-law, authorizing the town to issue $10,000 of debentures to complete and pay for debts contracted for electric light works.

The Canadian General Electric Company, Toronto, has been awarded the contract for supplying certain lights and electrical accessories for the Ottawa street lighting system, at a cost of $24,672.

Messrs. A. E. McLean and R. S. Trowsdale, of the Robb Engineering Company, Amherst, are installing the machinery in the new power station of the Sydney & Glace Bay Railway at Dominion No. 4.

On the 7th inst., power was turned on in the works of the Lakefield Portland Cement Co., Lakefield, Ont. Electric motors and transformers for 4,000 h.p. were installed by the Standard Construction Co., Montreal.

The electrical work for the grain conveyors for the Montreal harbor, including signals and telephone systems, is being done by the Standard Construction Co., Montreal. The motors are being supplied by Allis-Chalmers-Bullock, Limited.

William Scott, of the Pigeon River Lumber Company, Port Arthur, has applied to the city for fifty thousand horse-power of electrical energy, to use in the operation of large pulp mills, which it is the intention of erecting there in the near future.

At a special meeting of the council, Calgary, Alta., a decision was reached whereby the Calgary Power & Transmission Co., will supply all the electric current, power and energy required by the municipality for five years from date.

The city council, St Catharines, Ont., have decided to accept the tender of the Falls Power Company to light the streets until 1927 for $39.50 per light. The lighting so far has been done by the Hamilton Cataract Power Company at the rate of $72.50 per lamp.

During the coming season Revelstoke, B. C., purposes installing a 400 h.p. gas engine and a suitable gas producer plant; also a 150 k.w. dynamo for the supplying of electric energy for power. The present plant will be used for lighting only. C. B. Topp is city engineer.

The Minnedosa Power Co., Minnedosa, Man., have been granted the right to construct a dam across the Little Saskatchewan river at its outlet at Clear Lake, with the object of maintaining a high-water mark and supplying that town with power for electric light and other purposes.

A new power station is to be installed in Edmonton, Alta., requiring six miles of transmission lines at 10,000 volt, 3 wire, 3 phase, 60 cycle, spacing of poles 125 feet, of wires, 24 inches. The system will include nine incandescent circuits and two arc light circuits, and a power circuit.

A new power station is to be installed at Edmonton, Alta, requiring six miles of transmission line at 10,000 volts, 3-wire, 3-phase, 60-cycle, spacing of poles 125 feet, of wires 24 inches. The system will include nine incandescent circuits and two arc light circuits, and a power circuit. R. R. Keely, city engineer.

The C.P.R. has set aside entirely its steam plant for all its shops at Vancouver, B.C., and started up under electric power supplied by the British Columbia Electric Railway Company. The demand for the works, nominally, is 225 horse-power. This is divided among a number of motors, running from 75 horse-power down to 5 horse-power. The electric plant was installed under the supervision of Mr. Chambers, of Winnipeg, the C.P.R.'s electric expert.

Steam and Gas Power Plants.

The Cape Breton Prospecting Co., Sydney, N. S., will install a new steam plant.

The Massey-Harris Co., Toronto, are going into the question of installing producer gas plants and engines.

The governors of McGill University, Montreal, are considering the advisability of installing a power house to supply electric power and light for the university

The Central Heat, Light & Power Co., Montreal, are installing an extra 400 h.p. boiler, with a view of extending their steam and hot water system of heating stores and buildings.

General Manufacturing News.

The steel plant at Sault Ste Marie, Ont., has shut down for repairs.

The Wilson Leslie Company, will erect a large flour mill in Saskatoon, Sask.

The Manitoba Peat Co., Fort Francis, Ont., expect to rebuild in the spring.

The Pigeon Fertilizer Co. of Nova Scotia, will erect a plant in Vancouver, B.C.

The Toronto & Bellville Rolling Mills, Limited, Belleville, Ont., have assigned.

Hon. Adam Beck has purchased the Butterworth box factory at Hamilton, Ont.

An electro-plating works has been started by H. Greenland and M. J. Gavin, in Orillia

The new plant of the Dominion Wheel Co., at Lindsay, Ont., recently commenced operations.

The Silliker Car Co., Halifax, N. S., will

erect new buildings at a cost of about $25,000.

F. W. Bird & Son, Hamilton, Ont., are considering the erection of a factory at Hastings, Ont.

The Ontario Iron & Steel Co., Welland, Ont., are erecting a large addition to their new plant.

A boiler exploded at the Longue Pointe Cement Works, Montreal, badly wrecking the building.

A new factory will be erected at Calgary, Alta., next season, by the Dominion Match Company.

The Ham & Nott Manufacturing Company, Brantford, will enlarge their factory, at a cost of $40,000.

Harry Johnston, of Phelpston, is trying to locate a brick factory in Guelph, if conditions are favorable.

A $20,000 fire destroyed the fur establisbment of Messrs. Duc & Vandry, Clarke street, Ville St. Louis, P.Q.

The works of the Hamilton Powder Co., at Departure Bay near Nanaimo, B.C., exploded; loss about $40,000.

The Sarnia Brass Works, Sarnia, Ont., manufacturers of plumbers' brass goods, will shortly be in operation.

The new cold storage plant being erected for the Edmonton Produce Co., Edmonton, Alta., will cost about $50,000.

The Windsor Belt Dressing Co., Limited, have started manufacturing belt dressings and boiler compounds at Windsor, Ont.

A brass and iron bedstead factory may be erected at Goderich, Ont., next spring by F. C. Hennicke, Buffalo, N.Y.

The Smart-Turner Machine Co., Limited, Hamilton, are supplying A. Knowles, London, with a single vacuum pump.

The ratepayers of Meaford, Ont., voted favorably on a by-law to grant a bonus of $10,000 to the Seaman, Kent Co.

The name of the Dominion Dump Car Co., Ltd. Montreal, has been changed to that of the Hart-Otis Car Co., Limited.

Tbe capacity of the Dominion Iron & Steel Company's rail mill at Sydney has been doubled during the past two months.

Mr. Jenkins, Morrisburg, Ont., contemplates the erection of a tin plate and galvanized iron factory at Vancouver, to cost about $150,000.

The premises of tbe Montreal Suspender & Umbrella Co., at Arnprior, Ont., were burned to the ground. The loss is estimated at $50,000.

The main building of the Standard Drain Pipe Co., St. John's, Que., was destroyed by fire. The loss to buildings and machinery will reach $125,000.

The Sydney, N.S., Cement Company have decided to enlarge their plant to admit the manufacture of brick from slag, which has hitherto been a refuse.

The Canadian Tin Plate and Sheet Steel Co., Morrisburg, Ont., the first industry of its kind in Canada, recently commenced the manufacture of steel plate and sheet iron.

The Regal Sbirt Co., Hamilton, are installing a duplex pump in their new factory, which they purchased from the Smart-Turner Machine Co., Limited, of the same place.

The Page-Hersey Iron Tube & Lead Company, Toronto, may issue new stock to the amount of $1,500,000 some time during the year, making a total of $3,500,000.

Work bas started on the new buildings at Welland of the Page-Hersey Company, iron pipe manufacturers. Tbe building will cost $150,000, and will employ one thousand men.

Work bas commenced on tbe steel structure of tbe enlargement of tbe International Portland Cement Mill at Hull, by the Phoenix Bridge Co., who have tbe contract for this work.

Vancouver may have a tin plate industry in the near future. R. Jenkins, Morrisburg, has been negotiating with the council of Vancouver, and a $150,000 plant may be built in the spring.

T. E. Ferris has secured the contract for the stone foundations, and W. S. Homan, the contract for the superstructure for the proposed factory for C. S. Peaslee & Son, Niagara Falls, Ont.

Excavation work bas been completed for the large new factory aud office building to be erected on Adelaide street, near York, Toronto, by the James Morrison Brass Manufacturing Company.

The O. M. Edwards Co., manufacturers of window fixtures, shade rollers, trap doors, etc., of Syracuse, N.Y., are considering removing their Canadian factory from St. Catharines, Ont., to Montreal.

The Collier-Cunningham Company, Peterboro, Ont., have purchased machinery for the equipment of their new factory, where they will manufacture electric irons and all kinds of electrical heating apparatus.

Representatives of the Canadian Smelting & Refining Co., Toronto, recently visited Sault Ste. Marie, Ont., for the purpose of making arrangements for the erection of a mammoth smelting plant at tbat town.

The Frank H. Fleer Co., Toronto, intend erecting two reinforced concrete factories in that city, for the manufacture of gum. A site has been secured on Sterling road, and about $65,000 will be spent on the new buildings.

The ratepayers of Campbellford, Ont., have carried a by-law to build a $60,000 power plant at Middle Falls. The contract for the dam has been let to Brown & Aylmer, and Bogue & Buchanan, of Peterboro, will erect the power-house.

Fire destroyed the premises of Messrs. Lockerby & McComb, manufacturers of tarred felt, builders' material and roofing supplies. The loss is about $50,000, and water caused damage to the extent of $1,000 to the Mount Royal Foundry Co.

The Cbatham Carriage Co. bave definitely located in Dresden. They bave taken over tbe plant formerly owned by Wm. Rudd, and have set several men to work. They will use the Rudd factory till their own new plant is built and equipped.

Tbe Saskatoon Iron Works, Saskatoon, Sask., have closed down for a month, owing to the new company taking over the interests of C. Splayford. The works will open under the direction of the joint stock company which was organized recently.

A new industry bas just been added to Saskatoon in tbe shape of a tent-making establishment. G. C. Lawrence is at the head of the new enterprise, which has started on Twentieth street. Harness making will also be a branch of the business.

Tbe premises of Lockerby and McComb, manufacturers of tarred paper, 65 Sharon street, Montreal, were destroyed by fire on the 6th inst. Loss was covered by insurance. Arrangements were made at once to handle orders until new plant can be installed.

The National Wire Fence Company, Merrickville, have decided to remove their interests to Prescott. The reasons given for the move are that Prescott offers a better point for getting in wire from United States, and tbe cost of transhipping will also be annulled by the move.

The Fordwick Co., who are erecting large cement works at Longue Pointe, Montreal, have sold the property and machinery to the Vulcan Portland Cement Company, Montreal. It is expected that this large plant will be in running order by May, 1908, and will give employment to about 400 men.

The Fairchild Co., Winnipeg, has been taken over by the John Deere Plow Co., Moline, Ill. In tbe past the Moline Co. have been doing business through the Winnipeg company, but owing to the increasing Canadian trade, it was decided to become more closely connected with the Canadian market.

The Nash Thermostats, Ltd., have opened a branch factory on Richmond street, Toronto, to manufacture heat, moisture and pressure regulators, boiler feeds and air filters. The company have secured the manufacturing and selling rights for Canada from the parent company of the same name in the United States.

John R. Ralston, of Toronto, has written the Brantford council asking what inducements that city can offer to an industry to be established for the manufacture of all kinds of glassware. The industry in question would bave a pay roll of $1,175 per week and the writer states would employ a considerable amount of bands.

The Canadian Government purposes adding to the present mint an annex for the purpose of refining gold and silver, as the quality as it is smelted now cannot be relied upon. Work will commence in the spring, and latest types of electric-driven machinery will be installed. The cost of the refinery will probably be $15,000.

The marble quarries at Springfield, fifty miles from Montreal, are now being opened up again by the Missisquoi Marble Co., who bave about seventy men at work at present. This number will be increased during the following summer. The equipment consists of steam drills, gang saws, planer, lathe, pneumatic tools, cranes, air compressor, etc.

The Doty Engine Works, Goderich, Ont., are planning the addition of a plant for the manufacture of boilers and steel frames for boats to their present works. This will be done providing the town grants the company certain concessions. Tbe new works would entail tbe expenditure of about $40,000, and would provide employment for 100 men.

The Fordwick Company has transferred to the Vulcan Portland Cement Company a large block of land in Longue Pointe, Que., with buildings, plant and machinery thereon. The construction of the plant has been in the hands of the Fenwick Company, the present registration being the formal transfer of that portion of the work completed. The construction started in November, 1906, and it is expected that the plant will be in working order by May. The concern, it is said, will give employment to 400 men.

Planing, Saw and Shingle Mills.

The Evans Company, Sudbury, Ont., will rebuild their planing mill, which was recently destroyed by fire.

The planing mills of F. J. Moore & Son, of Lakefield, Ont., has been destroyed by fire. Loss on mill, machinery and stock, $10,000.

The Rathbun Company's sash and door factory at Deseronto, Ont., which has been closed down for repairs since December, resumed operations recently.

The Pigeon River Lumber Co. bave applied to Port Arthur, Ont., for 50,000 h.p. electrical energy to be used in the operation of large pulp mills they purpose erecting.

The flour mill of tbe Lakefield Milling Co., Lakefield, Ont., has been destroyed by fire. Loss on mill and contents, $25,000. Mill owned by the Dixon Company, Peterboro.

An American syndicate are to establish a sash, door and woodworking factory in Fort Francis, Ont. Messrs. Myers, Damm & Nord, Minneapolis, represent this syndicate.

The Dalhousie Lumber Company, whose mills were destroyed by fire some time ago, has been re-organized and a new mill will be constructed and additions made to the shingle mill.

The Dominion Iron & Steel Company, Sydney, N.S., is reported to have purchased some three hundred acres of valuable timber at East Bay, N.S., and should reports prove satisfactory mills will be installed on the property.

Work will begin at once on the big mill to be erected by the Red Cliff Lumber Co., at Alberni, B.C. Railway connection has been completed by the E. & N. Railway, and two other lumber companies have now selected sites for large mills.

F. H. Coarson, of Colebrooke, N.H., has acquired a mill site at Lynds Cove, Que., at the mouth of the Grand Cascapedia river. It is his intention to build a large log lumber mill, with shingle and rossing mills attached. Additional wharves will also be built. The estimated output of tbese mills is expected to be from five to six million feet a year.

Railway and Marine News.

Stratford, Ont., is considering the starting of a street railway.

Tbe G.T.R. is erecting a small factory on Sebastopole street, Montreal, to cost $4,000.

The C.P.R. has sold to the Canadian Bronze Co. a block of property on Delorimier avenue, Montreal, for $44,000.

The warehouse of tbe Canadian Northern Railway Co., at Humboldt, Sask., was destroyed by fire recently. Loss about $5,000.

Plans are being prepared for the erection of some additional buildings at tbe G.T.R. locomotive sbops at Port Huron, Mich.

The Victoria Macbinery Depot, Victoria, B.C., have been awarded the contract for repairing the Canadian Pacific steamer "Tartar." The price is $10,000.

A company of local business men of Hamilton, Ont., is being formed for tbe purpose of constructing an electric railway along tbe face of the mountain.

The G.T.R. have ordered 20 Richmond compound consolidation locomotives from tbe Locomotive and Machine Co., of Montreal, for delivery in Sept., 1908.

The C.P.R. main line between Fort William and Winnipeg will be double-tracked during 1908. The distance is about 425 miles, of which 200 miles were laid in 1907.

The Grand Trunk has acquired additional ground at St. Henri, P.Q., for extending their system. The property contains 19,200 square feet, and tbe price was $10,000.

The Hamilton Radial Electric Railway Company are seeking permission from Parliament to build and operate a line from Brantford, Ont., to a point on the Detroit river at or near Windsor, Ont.

The Mount McKay and Kakabeka Falls Railway Co., Port Arthur, Ont., will apply to tbe Legislative Assembly of Ontario for power to build on either the north or south side of the Kaministiquia river.

The headquarters of the Winnipeg-Fort William division of the Transcontinental Railway have been removed from Kenora, Ont., to St. Boniface, Man. Track-laying will be pushed and trains will be running soon.

The Department of Marine and Fisheries, Ot-

tawa, will call for tenders for the construction of a new ice-breaker for use between Prince Edward Island and the mainland. The estimated cost is put at $600,000.

The work of constructing a second track on the C.P.R., Ontario division, between Smith's Falls and Toronto will be gone on with early in the season, and it is expected to have it completed by the end of the year.

A deputation from Barrie, Ont., has been informed that by including all G.T.R. property, present and to be acquired, in a fixed assessment of $35,000, the company will erect car repair shops for the northern division there.

Application will be made by the C.N.R. at the current session of the Dominion Parliament for an act authorizing, in addition to the construction of branch lines, an increase of the capital stock of the company to [illegible],250,000.

The G.T.P. recently sent their chief bridge engineer, J. G. Legrand, of Montreal, to report upon the cost of a steel bridge over the Pembina river, near Edmonton, Alta. It is estimated that the structure would cost $250,000.

The Grand Trunk Pacific has awarded a contract to Foley Bros., & Larson, of St. Paul, Minn., for the construction of 126 miles from a point six miles east of Edmonton to Wolfe Creek, 120 miles west of Edmonton. The contract amounts to several million dollars.

The Grand Trunk Pacific Co. have awarded a contract to Foley Bros. & Larsen, of St. Paul, Que., for the construction of 126 miles from a point six miles east of Edmonton, Alta., to Wolfe Creek, 120 miles west of Edmonton. The contract amounts to several million dollars.

The Bow River Collieries, Lethbridge, Alta., will apply at the coming session of the Legislature for a charter to construct a railroad from the mine, which is 55 miles north of that city on the Big Bow river, to the main line of the C.P.R., a distance of 15 miles. As soon as the charter is secured construction will be commenced.

At the current session of the Dominion Parliament application will be made by the Northern Quebec Railway for an act authorizing the construction of a branch line from St. Jerome to St. Eustache, Que., and a line from Ottawa, via Hawkesb[illegible]t., to Montreal, branching on Montreal Island to enter Montreal from the northeast and southwest.

The Dominion Parliament will be asked by the Edmonton, Yukon and Pacific Railway, at the current session for an act authorizing the issue of bonds, debentures or other securities to the extent of $25,000 a mile in respect of the company's lines lines already constructed or to be constructed east of the foothills of the Rocky Mountains, and to $35,000 a mile on other portions of the company's line; also for an act authorizing the construction of a branch line from some point on the previously authorized line to Vancouver, B.C., and a branch to the headquarters of the McLeod and Brazeau rivers.

The C.P.R. has just placed a large order for cars with the Dominion Car & Foundry Company, Montreal. The management closed a contract with the Montreal Car & Foundry Company for 400 composite steel and wood freight and ballast cars. The contract for the steel required for these cars has been given to the Nova Scotia Steel Company, of New Glasgow.

During 1908 the C.P.R. purpose building the following branch lines in the west: Complete line from Tuxford (Moose Jaw north) to Lacombe, Alta., on the Edmonton branch. Complete line from Saskatoon through to Wetaskiwin, Alta., on the Edmonton branch. Complete line from Bredenbury to Esterhazy Alta. Alta. Complete line from Sheho, westerly into Complete line from Weyburn to Stoughton, Lanigan.

Mining News.

The Tyee Copper Co., Ladysmith, B.C., is making extensions to their smelting plant.

Good progress is being made with the plant of the Canada Zinc Co. at Nelson. They expect to be smelting zinc ores in the near future.

The foundations for the fifth giant ore crusher to be installed by the Granby Company, are now complete. The crusher is being placed at their Gold Drop mine, B.C.

The Smart-Turner Machine Co., Limited, Hamilton, Ont., are installing one of their hand-power traveling cranes in the haulage engine house, Bankhead Coal Co., Bankhead, Alta.

The Dominion Iron & Steel Co. have discovered a seven-foot seam of coal near Glace Bay, N.S. The company expect to develop a colliery capable of producing two thousand tons of coal a day.

Almost the entire plant of the Cobalt Concentrators at the Nipissing Mill were supplied by Canadian manufacturers, 50 out of 51 machines required coming from this source. The plant when completed will be capable of treating 100 tons of ore a day.

Coal mining in the Nicola Valley, B.C., is progressing very satisfactorily. A very high-grade coal is being mined and the output is increasing steadily. The Nicola Valley Coal Co. expects to increase its present output of 150 tons daily, to 1,000 per day in four months.

E. Lindeman, the Swedish minerologist, has examined the iron deposits of Vancouver Island, at the request of the Dominion Government. He reports that the ore is largely of the magnetic variety, and is the most valuable commercially of the various grades of iron ore found in the Dominion.

P. J. Power, Ottawa, has just completed a 7 ft. 3 in. diameter flume for the W. C. Edwards mill, Ottawa. It is ⅜-in- steel plate and double riveted. They are supplying the Canadian Copper Co., Copper Cliff, with a high-pressure locomotive boiler.

During the year the Dominion Coal Company, Sydney, N.S., have made a good many additions to their plant and equipment. At No. 2 Colliery the compressor house was enlarged and in addition to the compressors, now contains three 600 k.w. generators, driven by 700 h.p. horizontal steam engines. This plant is intended to supply electric power to all the Glace Bay district collieries for pumping, screening, etc. A general scheme of electric pumping and haulage is being installed at the collieries, for which the power is to be supplied from No. 2 power house.

Good progress is being made with the harbor works at Key Harbor, Ont., being built for the handling of iron ore and coal. The capacity of the dock plant will be 8,000 tons per day of ten hours. The power house is almost finished. Coal docks must also be built, and the transhipment of mineral alone must make Key Harbor a port of considerable magnitude within a short time, and immediately the Canadian Northern connection with Ottawa is completed it will be the enterport for all the Canadian Northern direct traffic between tidewater and the west.

Structural Steel Construction.

E. A. Johnson, county clerk, L'Original, Ont., will receive tenders until January 21 for the construction of an iron highway bridge over the Big Castor river, 125 feet span.

The Provincial Government have instructed W. Hidenbrand, C.E., one of the engineers of the New York and Brooklyn bridge, to prepare an estimate of the cost of a cantilever bridge over the falls. It is understood that the figure would be in the neighborhood of $150,000.

A large amount of bridge work is contemplated on the main lines of the C.P.R. and in British Columbia, where many wooden bridges will be replaced by modern permanent structures. A large amount of money will be spent in replacing the old structure.

Waterworks and Sewerage.

An up-to-date waterworks is being considered for Markdale, Ont.

Elmira, Ont., is to have a new waterworks system, at a cost of $25,000.

The waterworks, Sarnia, Ont., will be extended at a cost of about $6,000.

Humboldt, Sask., will spend $10,000 for a proper system of fire protection.

The town of Maple Creek, Sask., are installing a gravity waterworks system.

Septic tanks and filter beds will be added to the sewerage plant, Edmonton, Alta.

Plans are being prepared for an extension of the sewerage and waterworks system, Saskatoon, Sask.

Hespeler, Ont., ratepayers passed a by-law to raise $12,000 for the extension of a pipe line for fire protection.

The ratepayers of Hespeler, Ont., voted favorably on a by-law to raise $12,000 for the extension of a pipe line for fire protection.

The Guelph waterworks are installing a duplex boiler feed pump, being supplied by the Smart-Turner Machine Co., Ltd., Hamilton.

A by-law has been passed in Prince Albert, Sask., to raise $50,000 for the extension of the light and waterworks systems and extra fire-fighting equipment.

Several extensions will be made to the Simcoe, Ont., waterworks system. A sewerage system will also be installed next year. W. C. McCall is town clerk.

The town council, Carleton Place, Ont., are considering a by-law to raise $200,000 for the installation of a sewage and waterworks system, for that town.

Messrs. Galt & Smith, consulting engineers, of Toronto, are making up a report for a waterworks system for Swift Current, Sask., to cost in the neighborhood of $50,000.

City Engineer Rust, Toronto, has again recommended the construction of an overflow sewer from the University creek sewer eastward to the Don, at an estimated cost of $200,000.

Plans and specifications have been prepared and tenders will soon be called for a complete sewerage system for Revelstoke, B.C., costing upwards of $90,000. C. H. B. Topp, city engineer.

Tenders will be received by the Board of Control, Toronto, for a 15,000,000 and 6,000,000 Imperial gallon, triple-expansion vertical engine for the main and high level pumping stations. C. H. Rust is city engineer.

The water committee, Montreal, instructed Supt. Janin to advertise for tenders for a twelve million gallon steam-driven pump. These tenders must be in the hands of L. O. David, city clerk, before Feb. 20. The specifications give the manufacturers of large pumps considerable latitude as to its design, the only stipulation being that it be a steam-driven pump and supply the required amount of water.

The fire and water committee, Hamilton, on Jan. 22, decided to ask for new tenders for electric pumps for the Beach, one firm not having received correct specifications. Although $30,000 was voted for the purpose, it is not expected that the cost will be more than $24,000. A recommendation was made that a special committee consider the advisability of engaging an expert to advise in reference to specifications for a power plant and arc street lighting. Tenders will be asked for building the east end fire station.

Municipal Undertakings.

A by-law has been passed in Waterloo, Ont., to raise $12,000 for road improvements.

The city of St. John, N.B., propose to issue debentures for $500,000 for public improvements.

A by-law to spend $10,000 on a subway under the M.C.R. tracks, St. Thomas, Ont., has been carried.

The ratepayers of Lethbridge, Alta., voted favorably on a by-law to expend $30,000, for gas boring.

In connection with the $25,000 steel bridge at Listowel, Ont., it is probable that a by-law will be voted upon.

The by-law to build a town hall to cost $15,000 was carried at Meaford, Ont., and that to grant Seaman, Kent Co. a $10,000 bonus.

A complete system of sewerage and drainage is being planned for Ottawa's suburbs, Hintonburg, Ottawa South and East.

Niagara Falls—By-laws to spend $15,800 on waterworks improvements and $[illegible],800 on garbage disposal, and $23,000 in additional schools, were carried.

A proposition is before Ottawa's Board of Control to build a large concrete aqueduct at Bayswater, Ottawa West. This will involve an expenditure of about $200,000.

In order to cover the cost of proposed extensions to the municipal lighting plant, Napanee, Ont., a by-law for raising $10,000 by debentures will be submitted to the ratepayers.

The civic water committee, Vancouver, B.C., have decided to call for tenders for the building and laying of four miles of continuous stave pipe from the Seymour creek intake to the Canyon.

The ratepayers if Goderich, Ont., voted favorably on a by-law to transfer the guarantee of the bonds, amounting to $150,000, of the Maitland River Power Co. to the Ontario West Shore Railway Co.

The city council, Calgary, Alta., have received an offer to install a street railway plant. The offer comes from Alexander and Budd, acting for J. Balfour, London, Eng., and includes among other things, a fifteen-year franchise.

Vancouver, B.C., ratepayers voted on January 9, on money by-laws aggregating $1,068,800. Over a million dollars was asked with which to build permanent bridges in the city. For new schools, $130,000 is required; $28,800 for school offices and storerooms; addition to general hospital, $130,000, and to assist a permanent annual exhibition, $50,000. In addition to these, the city has still on its hands $445,000 of unsold debentures based on the three by-laws that received the assent of the ratepayers last summer, namely, sewer by-law, $300,000; macadam roads, $100,000; additions to schools, $45,000. The by-laws approved by the ratepayers totalled $1,560,000. Two were rejected, $28,000 for school offices and storerooms, and $[illegible] for exhibition. Those carried are for three steel bridges, $1,120,000; new schools, $130,000; opening, grading and macadamizing streets, $50,000; addition to general hospital, $130,000.

Building Notes.

The Government will repair the Chatham breakwater.

Edmonton will build a new public school at a cost of $13,000.

The Dominion Match Co. purpose erecting a new factory at Calgary, Alta.

A new town hall will be erected in Meaford, Ont., at a cost of about $15,000.

A Presbyterian church will be erected at St. Paul, Que., to cost about $165,000.

A Grossman, Vancouver, B.C., will erect an office building at a cost of about $75,000.

The Bakeries Co., Victoria, B.C., will erect a new building at a cost of about $9,300.

Edmonton will shortly call for tenders for the erection of a new incinerator to cost , 000.

The Imperial Oil Company, Winnipeg, are seeking a site for a warehouse at Saskatoon, Sask.

J. H. Smith, Toronto, will erect a two-storey brick factory in the spring at a cost of $10,000.

The A. J. Small Co. are considering the erection of a theatre in Ottawa at a cost of about $200,000.

Tenders will be called immediately for the construction of a market building in New Westminster.

A permit for a packing house, to cost in the vicinity of $100,000, has been issued in Edmonton, Alta.

An addition, 104x45 feet, three storeys high, will be erected to the Loretto Convent, Stratford, Ont.

The Dominion Government will extend the wharf at St. John, N.B., at a cost of about $300,000.

The Imperial Oil Co., Winnipeg, Man., are considering the erection of a warehouse in Saskatoon, Sask.

A fertilizer plant will be erected at Vancouver, B.C., by the Pigeon Fertilizer Co., of Nova Scotia.

The Department of Education has approved of the plans for the new $35,000 High School at Smith's Falls.

The International Harvester Co. will erect a large distributing warehouse in Lethbridge, Alta., immediately.

The Gendron Manufacturing Company, Toronto, contemplates alterations on their factory at a cost of $12,000.

The Ontario Government will build a galvanized iron experimental plant on Clifford street, Toronto, at a cost of $3,000.

The Sawyer & Massey Co., Hamilton, Ont., will erect an office and warehouse in Saskatoon, Sask., at a cost of about $130,000.

The Public Works Department, Fredericton, N. B., invite tenders up to February for stone abutments for steel bridge over the Black river.

Plans have been prepared for commodious public baths to be erected at Toronto at a cost of $40,000, and tenders will be called for at an early date.

Arrangements are being made by the G.T.P. for the construction of a large hotel at Prince Rupert, the building to cost a quarter of a million dollars.

Messrs. Fusee, McFeeters & Co., have been awarded the contract for the post office at Neysawa, Man. Work will commence next spring. Estimated cost, $28,000.

The Canada Railway News Co. will erect a hotel at Norway Point, Lake of Bays district. The new hotel will be up-to-date in all respects and will be opened about June 1.

Brown & Love, Toronto, have received the contract for the new astronomical observatory to be erected at Toronto by the Dominion Government. The contract price was $91,000.

A company to be known as the King Edward Hotel Co. has been organized in London, Ont., to erect a large hotel at a cost of about $500,000. The directors include G. Christie, E. Meredith, T. Beattie and P. Pocock, London.

R. Cumming, of Toronto, has been awarded the contract for the erection of a corrugated iron building on Clifford street, where a provincial experimental plant will be installed for the testing and analysis of sewage and water.

Messrs. Barnett and McQueen have been awarded the contract from the C.P.R. for the rebuilding of elevator D, at Fort William. Work on the excavation will be started at once. The contract price is about $600,000.

Guelph wants additional buildings for the accommodation of the annual winter fair. The city favors the erection of steel and cement buildings at a cost of between $20,000 and $30,000. A delegation will be sent to Ottawa to interview the Dominion Government.

The required amount of $15,000 having been promised by the Provincial Government in aid of the construction of the steel bridge across the North Arm, Fraser river, the proposition has been taken up seriously by the city council, New Westminster, and plans for raising the remaining $25,000 will be carried out without delay. According to plans laid out, construction will be started at an early date. A by-law to be submitted to the citizens in the near future embodying this proposal, is also under consideration by the council.

Companies Incorporated.

The Saskatoon Iron Works Co., Saskatoon, Sask., have been organized.

The Purmals Brick Co., Limited, Medicine Hat, Alta., have been incorporated.

The Capital Construction Co., Ottawa; capital, $95,000; to carry on the business of general contractors. Incorporators, W. C. Perkins, J. G. Gibson and H. H. Williams, all of Ottawa.

The Dart Union Co., Toronto; capital, $40,000; to manufacture articles of bronze and other metals; provisional directors, E. M. Dart, G. B. Chaplain, G. S. Chaplain, all of Providence, R.I.

The Brand Electro-Ozone Co., Toronto; capital, $100,000; to manufacture electrical appliances, etc. The provisional directors include, W. M. Gray, G. Laird and S. Egan, Toronto.

The Imperial Gas Power Co., Toronto; capital, $100,000; to manufacture gas and gasolene engines, automobiles, launches, washing machines, clothes wringers, etc.

The Berlin Steel Go-cart Co., Berlin, Ont.; capital, $100,000; to manufacture carriages and wheel specialties. Provisional directors, F. M. Hoffman, H. S. La Grange and N. Roos, all of Berlin.

The Dominion Petroleum Co., Montreal; capital, $150,000; to manufacture petroleum, ores, minerals, etc. The charter members include, Z. Perreault, E. Donahue and D. McLellan, of Montreal.

Jenking Brass Mfg. Co., Montreal capital, $350,000; to manufacture and deal in brass goods of all descriptions. Incorporators, A. L. Bonin, A. Mason, W. Young, H. L. Jenking, all of Montreal.

The Queen City Acetylene Generator Mfg. Co., Toronto; capital, $40,000; to manufacture gas appliances, etc. The provisional directors include, J. H. Watkins, H. Rose and W. H. Kahrs, Toronto.

The Elmira Upholstering Co., Elmira, Ont.; capital, $40,000; to manufacture upholstered furniture, etc. The provisional directors include, A. K. Dunke, G. Ratz and R. Schlender, Elmira, Ont.

The Twentieth Century Underfeed Furnace Co., Ottawa; capital, $100,000; to manufacture furnaces, stoves, ranges, etc. The provisional directors include, F. H. Lytle, R. W. Hart and O. H. King, Toronto.

Lewis & Smith, Toronto; capital, [illegible],000; to carry on the business of engineers and general contractors. Incorporators, H. Lewis, H. W. Wilcox, C. M. Doolittle and T. C. Haslett, all of Hamilton, Ont.

The Souris Hardware Co., Souris, Man; capital, $25,000; to manufacture hardware, tinware, paints, etc. The provisional directors include, A. L. Young, J. W. Breakey and J. A. Sterling, of Souris, Man.

The Utica Shale Pipe Co., St. Lambert, Que.; capital, $20,000; to manufacture brick, sewer pipes, etc. The charter members include, W. K. Lowden, St. Lambert, Que.; J. Rodger and W. M. Laurie, Montreal.

McLaughlin Motor Car Co., Oshawa, Ont.; capital, $500,000; to manufacture and deal in motor cars and parts; provisional directors, R. McLaughlin, C. W. McLaughlin and R. S. McLaughlin, all of Oshawa.

The Cobalt Shippers, Limited, Cobalt, Ont.; capital, $40,000; to carry on a mining, mining and reduction business. The provisional directors include, J. T. Kelly, S. Pierce and T. H. Jessop, Haileybury, Ont.

The Northern Iron Works, Limited, Winnipeg, Man.; capital, [illegible]; to manufacture iron, steel, copper, tools, tubes, boilers, wire-drawers, etc. The provisional directors include, A. C. McPherson, T. B. Monk and W. W. Kennedy, Winnipeg, Man.

The International Fence Co., Limited, London; capital, $300,000; to manufacture and deal in iron, wire and steel products. The provisional directors are, F. W. McLaren, C. B. Hillier, Edmund Meredith, Jessie M. Ellis and Rose Riley, all of London.

The Imperial Gas Power Co., Ltd., Toronto; capital, $100,000; to make gas engines, automobiles, launches, and other articles of machinery and supplies. Provisional directors are, W. B. Hampton, James Donnelly, W. B. DeGuerre, C. G. Munro and J. W. Forster, all of Toronto.

Lymburner, Limited, a new electrical engineering concern, has been incorporated at Montreal, Que., with a capital of $75,000. They have taken over the business formerly carried on under the style of L. A. Bouvier. Amongst the incorporators are, L. M. and H. N. Lymburner, Joseph Rivet and J. A. Boisvert.

The Walbridge Mfg. Co., Mystic, Que.; capital, $20,000; to manufacture tools, wood and iron working machinery, engines, boilers, water wheels, shafting, hangers, pulleys, stoves, furnaces, etc. The charter members include, A. S. Walbridge, B. W. Guthrie, Mystic, Que., and L. A. Knight, Manchester, N.H.

Trade Notes.

J. de Clercy, C.E., has moved from Dorchester street, to offices at 62 Ontario street, Montreal.

The Dynamic Machine Works, Limited, Montreal, are supplying 100 worm gears for use on lock gate openers for Government canals.

The Robb Engineering Co., Amherst, N.S., have been awarded the contract for placing three new boilers in the Montreal waterworks.

Bateman's Machine Tool Co., Ltd., Leeds, Eng., have just received an order from the Quarry Bay Shipyard, Hong Kong, China, for a number of their planers.

Among the orders received by Smart-Turner Machine Co., Ltd., Hamilton, for feed pumps, are: E. D. Smith, Winona; Normal School, North Bay; Grand Trunk Railway.

To a representative of Canadian Machinery the shops of the Toronto & Hamilton Electric Co., Hamilton, appeared very busy. The management say they have quite a bit of work on hand.

Krugg & Crosby, Hamilton, are very busy at the present time turning out small marine engines for motor boats, in anticipation of the spring demand. They are building both single and two-cylinder engines.

The Dayton Malleable Iron Co., of Dayton, Ohio, have added to their foundry equipment a new steel runway, supporting a three-motor electric traveling northern crane, 35 feet span. Both crane and runway were furnished by the Northern Engineering Works, of Detroit, Mich.

L'Ecole Polytechnique, in connection with Laval University, Montreal, has recently placed an order with the Canadian Fairbanks Co. for a six b.p. special electric gas engine and 3½ k.w. direct current dynamo for experimental and demonstrating purposes.

Sheldon's, Ltd., Galt, appear to have plenty of work on hand. To a representative of Canadian Machinery the shops appeared quite busy; although around the New Year they were running on a nine-hour day. They made no reduction in wages.

The Evans Rotary Engine Company of Canada, Ltd., have sold Seaman, Kent Company, Meaford, a 300 16-candle power electric light plant to light their new factory. The unit consists of an Evans rotary engine direct connected to a C.G.E. direct current compound wound generator.

The Dominion Heating & Ventilating Co., Hespeler, Ont., are installing a heating and humidefying plant for the Brantford Linen Co., Tillsonburg. They are also installing dust collecting systems for Sheaden Brush Works, Hamilton, and for O. McVean, furniture factory, Dresden, Ont.

The business of the Ontario Wind Engine & Pump Company, Limited, has extended all over the continent and they have had large sales of windmills, water towers, steel saw frames, well-drilling machinery, gasolene engines, etc. Frequent additions to their plant have been necessary to attend to their ever growing business and still further additions to the factory and improvements in machinery are now contemplated.

The Lumen Bearing Company, on January 3rd and 4th, observed its fourth annual gathering of office and sales forces at the Buffalo plant. The daily sessions were devoted to discussing business methods and plans, with an occasional original paper on a subject particularly relative to bearings. The meeting wound up with a banquet, given by the company, at which sixteen were present.

The Metal Shingle & Siding Co., Limited, of Preston, Ont., have shipped six carloads of corrugated galvanized sheets for the new plant of the Great Lakes Portland Cement Co., at Port Colborne, Ont. They have also secured the contract for supplying the same material to be used in constructing the Vulcan Portland Cement Co.'s new works at Longue Pointe, Que., near Montreal.

At the annual meeting of shareholders of Alex. McArthur & Co., manufacturers of paper and roofing materials, Montreal, the reports showed the affairs of the company to be in a satisfactory condition. The following directors were re-elected: Colin McArthur, D. J. Munn, F. Robertson, C. P. Tucker, E. J. Rowlands. At a meeting of directors, held immediately afterwards, the following officers were appointed: President, Lt.-Col. C. McArthur; vice-president, D. J. Munn; secretary-treasurer, E. J. Rowlands.

The capital of the Hamilton Steel & Iron Company, Hamilton, Ont., has been increased from $1,513,600 to $5,000,000. This company was organized in 1894, and it is now one of the largest steel plants in the country, having an output of about 500 tons a day. At one time the prospects of the concern were not quite so rosy as they are to-day, but the rapid development has warranted the increase in the stock and as a result those who risked their money in the early stages of the company's existence will now be well rewarded.

J. C. McLaren Belting Co., Montreal, held annual convention of travelers in January, representatives covering territory from Halifax to Vancouver being present. Last year's business was discussed and the policy outlined for the present year. The meetings were brought to a conclusion with the annual banquet at Place Viger Hotel. In addition to the travelers, the heads of the various departments were present. F. A. Johnson, general manager, presided, in the absence of the president through illness. The chairman, in responding to the toast to the firm, expressed himself well satisfied with the large advances made during the past year and notwithstanding all the recent talk of financial stringency he had every faith in an equal, if not greater increase, being made in the coming year.

Preparing Plans for New Building.

Goldie & McCulloch Co., Ltd., Galt., are preparing plans for a large new building, to be an addition to their present works.

Not Making Automobiles Now.

The Packard Electric Co., St. Catharines, are no longer making automobiles. That will be done for the Olds Mobile Co., in Toronto.

Champion Rivet Plant Delayed.

The Champion Rivet Co., Cleveland, O., write Canadian Machinery that the project they had on hand to establish a plant in Canada, at Windsor, is now in abeyance, and they do not expect to do anything definite for some time.

Change of Name.

The name of the Vulcan Machine Tool Co., 116 Adelaide street west, Toronto, has been changed to Kinsey Bros. These people make a specialty of confectioners' machinery and tools.

McClary to Build New Foundries.

The McClary Mfg. Co., London, have decided to equip one of the present warehouse buildings with machinery for manufacturing purposes. This will be done at once. In the spring work will be commenced on new foundry buildings.

Foundry Just Completed.

The Hartley Foundry Co., Brantford, have just completed a fine new foundry building, with small pattern shop in connection. The building is 50x100 feet. They do jobbing work for contractors and local manufacturers.

Thinking of Enlarging.

Woelfle Bros., tool makers and general machinists, Berlin, Ont., are thinking of extending their business by moving into a larger building and conducting a more vigorous campaign for business. It is possible that increased machine tool equipment will be wanted.

Automobile and Motor Boat Show.

In Toronto on March 21 to 28, will be held the annual show of the National Automobile, Motor Boat and Sportsmen's League. It will be held in the St. Lawrence arena, and in addition to the regular class of exhibits, there will be one made by the four large Canadian railways.

Progress in Berlin Mfgs. Co.'s Works.

The plant of the Berlin Mfg. Co., Hamilton, Canada, manufacturers of woodworking machinery, is just about completed; and the installation of the machinery has commenced. This firm are having all the ordinary tools made in Canada, but are bringing some special machinery from the States. It is thought that by spring the company will be able to commence work.

Contemplating New Machine Shop.

John H. Hall & Sons, Brantford, are thinking of putting up a new machine shop in the spring, and will probably be adding to their machine tool equipment. This firm make a grinder in different sizes, and special machinery.

Foundry Completed.

The new molding shop of the Gartshore-Thompson Pipe Foundry, Hamilton, has just been completed. This molding shop is designed to do jobbing work and small repetition work for their pipe foundry. The management are considering the installation of molding machines.

Proposed Large Car Factory.

Negotiations are being conducted at present between several Canadian municipalities, including Hamilton, Peterboro and St. John's, Que., with a large manufacturing concern, which proposes to establish a large car making plant in Canada, upon which there will be an expenditure of $1,000,000 or more. R. D. Isaacs is carrying on negotiations for the concern.

To Enlarge Smelter.

J. P. Graves, president of the Granby Co., says that the company intended at an early date increasing the capacity of the big smelter at Grand Forks by 1,000 tons daily. Its present capacity is from 3,000 to 3,500 tons daily. The Granby mines and smelter are running full and all labor troubles have been settled. The Granby mines are at present raising about 1,300,000 tons per annum, which will be increased to nearly 1,650,000 tons if the smelter is increased.

Number of New Machines.

Quite a number of machines are being built by the London Machine Tool Co., Hamilton, upon which they have made some radical changes and improvements, over their standard machines. Some of these machines are being built for the Berlin Mfg. Co., Hamilton, and include some large pneumatically-operated planers. Descriptions of these machines will appear in later issues of Canadian Machinery.

Anticipate Placing Orders.

Unlike some of the other Galt industries, the R. McDougall Co. have been running on full time, with lots of work on their floor. To a representative of Canadian Machinery, the management said that they thought of placing some orders for machine tools at once to show their confidence in the market conditions. They are building quite a number of tools for the Canadian Fairbanks Co.

Robertson Machinery Co.'s Situation.

A petition has been filed at Osgoode Hall to wind up the Robertson Machinery Company, of Welland. The company was organized in 1905 to take over the business of Robertson Bros., and had a nominal stock of $40,000. In May last material loss was experienced as a result of a fire, and it was necessary to put a chattel mortgage on the plant, with the Imperial Bank for $5,211. The Canadian Fairbanks Co., the petitioner to wind up, is a creditor to the extent of $270.54.

Large Pulp Plant in Newfoundland.

The Anglo Newfoundland Development Co. are building an immense plant at Grand Falls, Newfoundland, to supply their series of daily, weekly and monthly publications with paper. When completed, this will be one of the largest pulpwood paper plants in the world. The Waterous Engine Works Co., Brantford, are negotiating at the present time in regard to the placing of machinery for making pulpwood. The Waterous Engine Co. inform Canadian Machinery that nothing definite has been settled.

To Build New Machine Shop.

At the annual meeting of the shareholders of the Goold, Shapley & Muir Co., Brantford, held Jan. 18, it was decided a new machine shop 132x54 feet, should be erected during the present year; and also a wood shop, 100x54 feet. The machine shop will be equipped with a traveling crane.

The company are now occupying the new building built during the past year, including blacksmith shop, galvanizing room and warehouse, costing in all $40,000.

The officers elected are: President, E. L. Goold; vice-president, W. H. Shapley; treasurer, Henry Yeigh; secretary, W. H. Whittaker; manager, John Muir.

New Foundry and Machine Shop.

The Northern Foundry and Machine Co., of Sault Ste. Marie, Ont., have purchased the old Lambert machine shop in that place, and are starting a foundry and machine shop to do all kinds of repair work. They expect to be running early in February.

The officers of the new company are: President, P. E. Young; vice-president, A. U. Smeader; secretary-treasurer, James N. Kendall. Messrs. Young and Smeader are both first-class machinists, Mr. Kendall is a molder, and J. N. Neil will be the pattern maker. J. N. Neil will be general manager. These gentlemen are all well and favorably known in the Soo. They will each give their personal attention to the business.

Franco-British Exhibition.

The Canadian Government has in course of erection a large special building for the accommodation of Canadian exhibits at the Franco-British exhibition, which opens in London, England, May first next. The Government part of the display will consist of exhibits of the natural resources of Canada, such as agricultural products, minerals, forestry, fish and game, horticulture, dairying and food products. There will be accommodation reserved for the display of Canadian manufactures and where acceptable exhibits are offered, very generous treatment will be accorded them by the Government.

Applications will be received up to the end of the present month and enquiries should be addressed to Mr. W. A. Burns, Exhibition Branch, Department of Agriculture, Ottawa.

New Firm of Dealers.

Jones & Glassco are starting a new business, representing British firms in machinery and factory equipment and supplies. They are the sole agents for Canada for the Campbell Gas Engine Co., of Halifax, England, one of the oldest and largest British gas engine firms. Mr. Jones has made a specialty of producer gas, having studied the matter both here and in Germany, and has had practical experience with this gas in the Pittsburg district, and also in the Campbell Gas Engine Company's works. Mr. Glassco is an electrical engineer, a graduate of McGill University, Montreal, and formerly employed by both the General Electric and Westinghouse Companies. They are open to contract for power plants, electric lighting plants, and gas engines, and electric machinery for all purposes.

Shipyards Re-opened.

The Collingwood Shipbuilding Co., Collingwood, Ont., which closed down during January, several conflicting reasons being given for it, have now resumed operations.

The company are now taking on men as fast as they can be arranged with, and it is expected they will open out strong at the time appointed. Advertisements for labor have been sent out in various directions. A majority of the hands employed before the close down are still in town, and most of them will go back on Wednesday.

The company have plenty of work. A large amount of repair work is on hand, new scows are contracted for, and the agreement with the Northern Navigation Company for their new passenger steamer is believed to be practically closed, so that abundance of work is in sight for a long time ahead.

Extension of Listowel Foundry, New Machine Shop.

The business of the Listowel Foundry, Listowel, Ont., has been reorganized, and has been taken over by capable men, one having had very wide experience in foundry work. This gentleman has asked Canadian Machinery to withhold his name for the present.

The town has granted certain exemptions to the company, and very soon large additions will be made, in the form of a new building and equipment. At present job work is the chief business of the company, but when the new building is up, they will make the Reid molding machine, having obtained Canadian rights to manufacture.

For this they will equip part of the new additions as a machine shop. More will appear in Canadian Machinery concerning this later.

Montreal Locomotive Works, Ltd.

A change has been made in the name of the Locomotive and Machine Company, of Montreal, Ltd., and the concern will in future be known as the Montreal Locomotive Works, Ltd. A new building, 185 feet by 121 feet, has just been completed at Longue Pointe, where the works are located, and at a recent meeting of the company, reports showed that the capacity is now three hundred locomotives per year.

In this new building a 150-ton crane, with a span of 75 feet, and a 20-ton crane, with a 72 feet span, have been erected. The Canadian Westinghouse Co. are installing the lighting system, which consists of a number of Nernst lamps placed along the ceiling at from thirty to sixty feet from the floor. This building will be used for erecting. A trial was made in it with Nernst lamps, hung at fifty feet from the floor over the traveling cranes, and it was decided to install these lamps. They give the floor effective illumination. This type was first made in Germany by Dr. Nernst, and perfected by the Westinghouse Co.

Big Canal and Electric Project.

C. E. W. Smith, of New York, representative of a syndicate of American capitalists who have taken up the project of the construction of a ship canal from New York to Montreal, by way of the Hudson river, Lake Champlain, and the Richelieu, with the necessary canal adjuncts to the St. Lawrence, says that the project is now well advanced. The whole of the capital required for the completion of the great waterway is forthcoming. There had been a little delay in the preparations owing to the tightness of money, but as financial conditions were now easier he anticipated no further difficulties in the way of the execution of the project. Work at the southern end of Lake Champlain, which would cost something like $30,000,000, was now in progress. That at the Canadian end would be much less costly—probably not more than $7,000,000—but there was in connection with it an electric project which would have far-reaching effect, that would involve a few additional millions, but he was not prepared to discuss that, further than to say that it was proposed to construct a large dam near St. John's, fed from the Richelieu river, at a point where they could get a fall of seventy-four feet.

Engine Works Sold to A. Berg & Son.

The extensive engine works of the Canadian Shipbuilding Company, Limited, at the south-east corner of Niagara and Bathurst street, Toronto, have been acquired by Messrs. A. Berg & Sons, manufacturers of brickmaking machinery, Manning Chambers, Toronto. The purchasers will take control of the engine works just as soon as a clear title is given to the property by the Canadian Shipbuilding Company. The purchase price is about $1[illegible].

Originally the Bertram Engine Works Company, which was absorbed by the Canadian Shipbuilding Company, filled the orders for A. Berg & Son, but last year the John Inglis Co., Limited, 14 Strachan avenue, executed the contracts.

What may be expected to follow the sale of the engine works is the centralizing of the Canadian Shipbuilding Company's works at Bridgeburg and the consequent transfer there of the plant at the foot of Bathurst street.

Mr. Berg told Canadian Machinery that he intended remodelling the acquired works and installing a good manufacturing system. The shops will be changed around a good deal, and probably new machinery will be installed.

In addition to the line of brick machinery, they intend to make a producer gas plant, the patent for which the company have. Gas engines and other machinery may also be manufactured.

Merger of Gas and Electric Cos.

A merger of six large Quebec companies has been formed, the companies being, Quebec Railway, Light & Power Co., the Jacques Cartier Electric Light & Power Co., the Quebec Gas Co., the Frontenac Gas Co., the Canadian Electric Light Co., and the Quebec & Charlevoix Electric Railway Co.

The proposition is to strengthen these companies by uniting them in one large corporation. The present capital of the companies is $5,000,000 in stock, and $5,000,000 in bonds, or $10,000,000 altogether. At present it is claimed that the companies are just able to struggle along, and are unprogressive for lack of means, and that the consolidation and new capital will have the effect of bringing them right up-to-date in the way of equipment and plant, to the advantage of the city and the corporations alike.

There will be an increase in capitalization, additions being made from England. This increase in capital will probably double the present amount, making together a capital of $20,000,000

This amalgamation has been talked of for years; and it is thought that the English interests involved will make things go. They will immediately build the Quebec and Saguenay railway, and possibly another track of their own into the city of Quebec, running nearer the residential district along the river front.

All arrangements have been made towards securing electrical power for their line to Murray Bay, and other large works which are to be established, one of which is a large car building industry, the capital of which is all subscribed.

Dominion Iron & Steel Co. Again Win.

The full bench of the Supreme Court has delivered judgment in the appeal case of the Dominion Coal vs. the Dominion Iron & Steel Company, in the latter's favor on all points. The court holds that the contract is still in force, and clearly expresses the intention of the company.

The coal rejected by the Steel Company was not suitable for its purposes.

The Coal Company having coal in the Phelan seam suitable for steel making and coal not suitable, is bound to supply the former.

The Steel Company is entitled to damages equal to the difference between the contract price and the market value of all coal used by it since the breach in November, 1906. The Coal Company will have to carry out its contract and supply coal from the Phelan seam suitable for steel making, for the balance of the term of ninety-nine years.

The above are the principal points agreed upon by the five judges composing the court, which included the Chief Justice of Nova Scotia.

What Some of the Railways Will Do.

While the Canadian Pacific Railway will spend millions of dollars on its western extension and improvement programme during the coming season, the work will be mostly confined to completing construction and regarding that which was either commenced or planned last season. The main work this year will be the completion of the alternative route between Winnipeg and Edmonton by the Pheasant Hill branch from Sheho to Wetaskiwin on the Calgary-Edmonton line. Another feeder will be built parallel with this line, starting from Moose Jaw, running northwest to reach the main Calgary-Edmonton line at Lacombe.

The Ontario Railway Commission has decided to enter upon an aggressive construction campaign this year. J. L. Englehart, chairman of the commission, states that the Government road will be completed to the Grand Trunk Pacific right of way before next winter. The distance from the present terminus to the G.T.P. tracks is only forty-two miles, but it will be a very difficult piece of engineering, since for a large part of the distance it will run through a huge muskeg, and in other places there are heavy cuts. There is, however, no rock work.

Reported Merger of Shipyards.

A well-defined rumor is current that the details of a big ship-building amalgamation are being worked out. The factors in the merger are said to be the Canadian Shipbuilding Company, with yards at Bridgeburg and Toronto; the Collingwood Shipbuilding Company, of Collingwood; the Polson Iron Works, and possibly the big new company, with $1,000,000 capital, to be established in the near future at Fort William.

It is figured out that as a result an important business, which should be a very profitable one, but which so far has not come up to expectations, could be systematized so as to yield not only very handsome returns, but to meet the increasing demands of the great lakes traffic as it should be met.

The Collingwood Shipbuilding Company, which has the only available drydock suitable for the purpose, would be devoted almost entirely to the business of repairs. The Canadian Shipbuilding Company's shipyard at the foot of Bathurst street, would be permanently closed, and the yards at Bridgeburg enlarged and used for building the hulls of the larger vessels for the trade of the great lakes.

It is understood that the Mackenzie-Mann interests are in reality behind the projected merger. They together with the Nicholls-Pellatt interests are already largely interested in both the Canadian Shipbuilding Company and the Collingwood concern.

This report has been authoritatively denied as far as the Polson Iron Works are concerned by J. J. Main, manager. It has also been denied by Thomas Long, vice-president, that the Collingwood Shipbuilding Company have any interest in any such merger. Nothing further can be ascertained.

CATALOGUES OF THE TRADE.

CUPOLAS.—Circular of J. DeClerey, general agent, 62 Ontario street, west, Montreal, describing the Baillot cupola.

INDUCTION MOTOR PANELS.—Bulletin No. 91, descriptive of these panels, made by Crocker-Wheeler Co., Ampere, N.J.

AUTOMATIC CIRCUIT BREAKERS.—Circular No. 1107 of the Canadian Westinghouse Co., Hamilton, on their automatic circuit breakers.

GRINDERS.—Small booklet on grinders made by the Rowbottom Machine Co., Waterbury, Conn. Mention Canadian Machinery when writing.

WESTINGHOUSE RELAYS.—Circular No. 1147 on relays for alternating and direct current service. Issued by the Canadian Westinghouse Co., Hamilton.

CANADA METAL CO.—Small booklet containing a number of testimonial letters from different firms, issued by the Canada Metal Co., Ltd., Toronto.

GAS ENGINES.—Folder from Jones & Glassco, Sovereign Bank building, Montreal, illustrating and describing Campbell gas engines for town or producer gas.

HAMMANT STEEL CARS.—Some folders illustrating and describing the steel cars made by the Hammant Steel Car & Engineering Works, Crown Point, P.O., Ont.

PRODUCER GAS PLANTS.—A neat folder of Weber Gas Engine Co., Kansas City, Canadian offices at Toronto, giving useful information concerning their plants and engines.

TYPES K AND KG MOTORS.—Circular No. 1097 descriptive of the Westinghouse types K and KG motors for cranes, hoisting machinery No. 1107 of the Canadian Westinghouse Co.l Hamilton.

KERR STEAM TURBINE.—Bulletin No. 4 of the Kerr Turbine Co., Wellsville, N.Y., containing a brief technical description of the Kerr turbine. Mention Canadian Machinery when writing.

WRIGHT'S TAPER ROLLER BEARINGS.—Catalogue of Canadian Bearings, Ltd., Hamilton, descriptive of above line of bearings for shafting and other purposes. Mention Canadian Machinery when writing.

MURRAY CORLISS ENGINES.—Catalogue of Murray Iron Works Co., Burlington, Iowa, containing half-tones and drawings of their Corliss engines. A very interesting catalogue. Mention Canadian Machinery when writing.

STORAGE BATTERY AUTO-TRUCK.—Catalogue, 6x9 inches, of the Westinghouse Works, Pittsburg, Pa., illustrating and describing the Westinghouse storage battery auto-truck for industrial railways.

STEAM AND WATER SPECIALTIES.—Catalogue No. 10 of the Golden-Anderson Valve Specialty Co., Fulton Bldg., Pittsburg, Pa., of complete line of their steam and water specialties. Mention Canadian Machinery when writing.

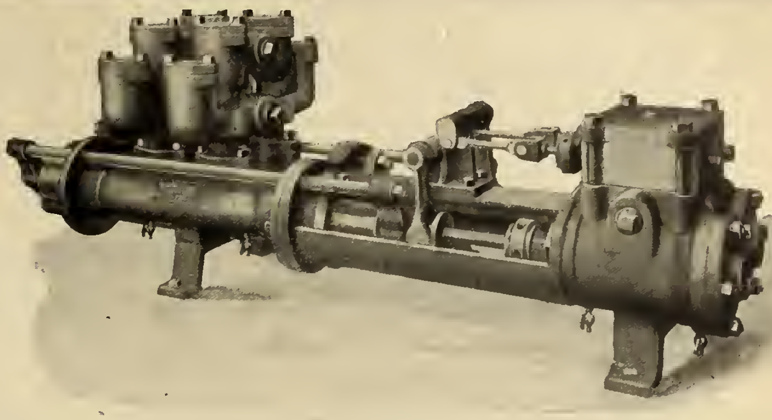
LIFTING MAGNETS.—A magnificently gotten-up catalogue of the Electric Controller & Supply Co., Cleveland, O., illustrating various types of lifting magnets and their use. The get-up is a work of art. Mention Canadian Machinery when writing.

CYLINDRICAL GRINDING.—Catalogue, 6 x 9 inches, of the Norton Grinding Co., Worcester, Mass., illustrating the Norton plain machines for cylindrical grinding. Well illustrated and complete information. Mention Canadian Machinery when writing.

CROCKER-WHEELER CO.—Bulletin No. 94, on alternating current switchboard panels; Bulletin No. 93, on small engine type D.C. generators; Bulletin No. 92, on combined generator and feeder panels. Crocker-Wheeler Co., Ampere, N.J. Mention Canadian Machinery when writing.

DEAN ENGINES.—Catalogue from the Dean Gas Engine and Foundry Co., Newport Kentucky, giving illustrations, equipment and prices of the Dean gas, alcohol, gasolene and distillate engines. Full descriptions are given with the bore, stroke and capacity of the cylinders.

THE MASSACHUSETTS FAN CO., Watertown, Mass., has just issued an additional section of its perpetual catalogue. This section, which comprises sixteen pages, and is entitled, "Vertical and Horizontal Engines for Fan Driving," includes illustrations, descriptions, dimensions and horse-power tables. The entire catalogue is thus brought up to a total of 116 pages of exceptionally valuable matter relating to blowers and exhausters, heating, ventilating, drying and mechanical draft apparatus, etc.



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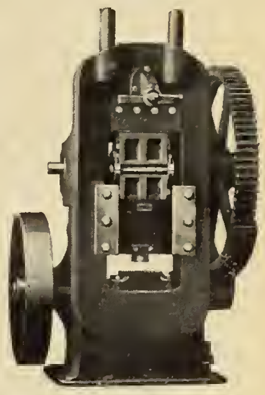

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Babbit Metal.
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Lumen Bearing Co., Toronto.
Rice Lewis & Son, Toronto.
Syracuse Smelting Works, Montreal
Tallman, J. A., & Sons, Hamilton

Bakers' Machinery.
Greey, Wm. & J. G., Toronto.

Baling Presses.
Perrin, Wm. R., & Co., Toronto.

Barrels, Steel Shop.
Cleveland Wire Spring Co., Cleveland.
Steel Trough & Machine Co., Tweed Ont.

Barrels, Tumbling.
Detroit Foundry Supply Co., Windsor
Dominion Foundry Supply Co., Montreal
Hamilton Facing Mill Co., Hamilton.
Gilmour J. New York.
Globe Machine & Stamping Co., Cleveland, Ohio.
John McDougall Caledonian Iron Works Co., Montreal.
Northern Engineering Works, Detroit.
H. W. Petrie, Toronto.
Sly, W. W., Mfg. Co., Cleveland
The Smart-Turner Mach. Co., Hamilton

Bars, Boring.
Hall Engineering Works, Montreal.
Niles-Bement-Pond Co., New York.

Bars, Grate.
Manitoba Iron Works Winnipeg
Wilson, J. C., & Co., Glenora, Ont.

Batteries, Storage.
Canadian General Electric Co. Toronto
Rice Lewis & Son, Toronto.
John Millen & Son, Montreal.

Bearing Metals.
Johnson, C. H., & Sons, St Henri, Montreal
Lumen Bearing Co., Toronto.

Bearings, Self-Oiling.
Wilson, J. C., & Co., Glenora, Ont.

Belting, Chain.
Canada Machinery Exchange, Montreal.
Greey, Wm. & J. G., Toronto.
Jeffrey Mfg. Co., Columbia, Ohio.
Manitoba Iron Works, Winnipeg
Waterous Engine Works Co., Brantford.

Belting, Cotton.
Canada Machinery Agency, Montreal.
Dominion Belting Co., Hamilton.
Rice Lewis & Son, Toronto.

Belt Dressing.
Stephenson Mfg. Co., Albany, N.Y.

Belting, Leather.
Canada Machinery Agency, Montreal.
The Canadian Fairbanks Co., Montreal.
Frothingham & Workman Ltd., Montreal
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H. W. Petrie, Toronto.
Sadler & Haworth Montreal
Williams & Wilson, Montreal.

Belting, Rubber.
Canada Machinery Agency, Montreal.
Frothingham & Workman, Ltd., Montreal
Greey, Wm. & J. G., Toronto.

Belting Supplies.
Greey, Wm. & J. G., Toronto.
Rice Lewis & Son, Toronto.
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Bending Machinery.
John Bertram & Sons Co., Dundas, Ont.
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London Mach. Tool Co., Hamilton, Ont.
National Machinery Co., Tiffin, Ohio.
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Benders, Tire.
A. B. Jardine & Co., Hespeler, Ont.
London Mach. Tool Co., Hamilton, Ont.

Blowers.
Canada Machinery Agency, Montreal.
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Blow-Off Tanks.
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Boilers.
Canada Foundry Co., Limited, Toronto.
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Goldie & McCulloch Co., Galt.
John McDougall Caledonian Iron Works, Montreal.
Manitoba Iron Works, Winnipeg.
Owen Sound Iron Works Co., Owen Sound
H. W. Petrie, Toronto.
Robb Engineering Co., Amherst, N.S.
The Smart-Turner Mach. Co., Hamilton.
Waterous Engine Works Co., Brantford.
Williams & Wilson, Montreal.

Boiler Compounds.
Canada Chemical Mfg. Co., London, Ont.
Hall Engineering Works, Montreal.

Boiler Makers' Supplies.
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Bolt Cutters.
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Rice Lewis & Son, Toronto.
London Mach. Tool Co., Hamilton.
National Machinery Co., Tiffin, Ohio.
Niles-Bement-Pond Co. New York.
Waterbury Farrell Foundry & Machine Co., Waterbury Conn.

Boring & Drilling Machines
American Tool Works Co., Cincinnati.
John Bertram & Sons Co., Dundas, Ont.
Canada Machinery Agency Montreal.
A. B. Jardine & Co., Hespeler, Ont.
London Mach. Tool Co., Hamilton.
Niles-Bement-Pond Co., New York.

Boring Machine, Upright.
American Tool Works Co., Cincinnati.
John Bertram & Sons Co., Dundas, Ont.
London Mach Tool Co., Hamilton.
Niles-Bement-Pond Co., New York.

Boring Machine, Wood.
Independent Pneumatic Tool Co., Chicago, Ill.
London Mach. Tool Co., Hamilton.

Boring and Turning Mills.
American Tool Works Co., Cincinnati.
John Bertram & Sons Co., Dundas, Ont.
Canada Machinery Agency, Montreal.
Gisholt Machine Co., Madison, Wis.
Rice Lewis & Son, Toronto
London Mach. Tool Co., Hamilton.
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.
Rice Lewis & Son, Toronto

Boring Tools.
Armstrong Bros. Tool Co., Chicago

Box Puller.
A. B. Jardine & Co., Hespeler, Ont.

Boxes, Lathe.
Steel Trough & Machine Co., Tweed, Ont

Boxes, Steel Shop.
Cleveland Wire Spring Co., Cleveland.
Steel Trough & Machine Co., Tweed, Ont.

Boxes, Tote.
Cleveland Wire Spring Co., Cleveland

Brass Foundry Equipment.
Ph. Bonvillain & E. Ronceray, Philadelphia
Detroit Foundry Supply Co., Detroit.
Dominion Foundry Supply Co., Montreal

Brass Working Machinery.
Warner & Swasey Co., Cleveland, Ohio.

Brushes, Foundry and Core.
Detroit Foundry Supply Co., Windsor.
Dominion Foundry Supply Co., Montreal
Hamilton Facing Mill Co., Hamilton.

Brushes, Steel.
Dominion Foundry Supply Co., Montreal

Buckets, Clam Shell.
Jeffrey Mfg Co., Columbus, Ohio

Buckets, Crab.
Jeffrey Mfg. Co., Columbus, Ohio

Bulldozers.
John Bertram & Sons Co., Dundas, Ont.
London Mach. Tool Co., Hamilton, Ont
National Machinery Co., Tiffin. Ohio.
Niles-Bement-Pond Co., New York.

Cables, Aerial and Underground.
Phillips, Eugene F., Electrical Works, Montreal

Cabinets, Lathe Tools.
Armstrong Bros. Tool Co., Chicago

Calipers.
Frothingham & Workman, Ltd., Montreal
Rice Lewis & Son, Toronto.
John Millen & Son, Ltd., Montreal Que.
L. S. Starrett & Co., Athol, Mass.
Williams & Wilson Montreal.

Canners' Machinery.
Brown, Boggs Co. Hamilton
Jeffrey Mfg., Columbus, Ohio
Wilson, J. C., & Co., Glenora, Ont.

Carbon.
Dominion Foundry Supply Co., Montreal

Carborundum Paper and Cloth.
Carborundum Co., Niagara Falls, N.Y.

Cars, Dryer.
Hammant Steel Car & Engineering Works, Hamilton, Ont.

Cars, Factory & Warehouse.
Hammant Steel Car & Engineering Works, Hamilton Ont.

Cars, Foundry.
Detroit Foundry Supply Co., Windsor
Dominion Foundry Supply Co., Montreal
Hamilton Facing Mill Co., Hamilton.
Hammant Steel Car & Engineering Works, Hamilton Ont.

Cars, Rolling Mill.
Hammant Steel Car & Engineering Works, Hamilton

Castings, Aluminum.
Lumen Bearing Co., Toronto
Tallman, J. N., & Sons, Hamilton

Castings, Brass.
Chadwick Bros., Hamilton.
Greey, Wm. & J. G., Toronto.
Hall Engineering Works, Montreal.
Kennedy Wm., & Sons, Owen Sound.
Lumen Bearing Co., Toronto
Manitoba Iron Works, Winnipeg
Niagara Falls Machine & Foundry Co. Niagara Falls, Ont.
Owen Sound Iron Works Co., Owen Sound.
Robb Engineering Co, Amherst, N.S.
Tallman, J. N., & Sons. Hamilton
Wilson, J. C., & Co., Glenora Ont.

Castings, Grey Iron.
Allis-Chalmers-Bullock Montreal.
Crowe's Iron Works Guelph, Ont.
Greey, Wm. & J. G., Toronto.
Hall Engineering Works, Montreal.
Kennedy, Wm., & Sons, Owen Sound
Laurie Engine & Machine Co., Montreal.
Manitoba Iron Works, Winnipeg
Maxwell, David, & Sons, St. Marys.
John McDougall Caledonian Iron Works Co., Montreal.
Niagara Falls Machine & Foundry Co., Niagara Falls. Ont
Owen Sound Iron Works Co., Owen Sound.
Robb Engineering Co., Amherst, N.S.
Smart-Turner Machine Co., Hamilton.
Wilson, J. C., & Co., Glenora, Ont.

Castings, Phosphor Bronze.
Lumen Bearing Co., Toronto

Castings, Steel.
Kennedy, Wm., & Sons, Owen Sound.

Castings, Semi-Steel.
Robb Engineering Co., Amherst N.S.

Cement Machinery.
Allis-Chalmers-Bullock, Limited, Montreal
Greey, Wm. & J. G., Toronto
Jeffrey Mfg. Co., Columbus, Ohio
John McDougall Caledonian Iron Works, Co., Montreal
Owen Sound Iron Works Co., Owen Sound

Centreing Machines.
John Bertram & Sons Co., Dundas, Ont.
Jeffrey Mfg Co., Columbia Ohio
London Mach. Tool Co., Hamilton, Ont.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Hartford, Conn.
Standard Bearings Ltd., Niagara Falls

Centres, Planer.
American Tool Works Co., Cincinnati.

Centrifugal Pumps.
Gas & Electric Power Co., Toronto
John McDougall Caledonian Iron Works Co., Montreal.
Pratt & Whitney Co., Hartford, Conn.

Centrifugal Pumps—Turbine Driven
Kerr Turbine Co., Wellsville, N.Y.

Chain, Crane and Dredge.
Frothingham & Workman, Ltd., Montreal

Chaplets.
Detroit Foundry Supply Co., Windsor.
Dominion Foundry Supply Co., Montreal
Hamilton Facing Mill Co., Hamilton.
Paxson, J. W., Co., Philadelphia

Charcoal.
Detroit Foundry Supply Co., Windsor.
Doggett, Stanley, New York
Dominion Foundry Supply Co., Montreal
Hamilton Facing Mill Co., Hamilton.
Paxson, J. W., Co., Philadelphia

Charcoal Facings.
Doggett, Stanley, New York

Chemicals.
Canada Chemical Co., London.

Chemists' Machinery.
Greey, Wm. & J. G., Toronto.

Chemists, Industrial.
Detroit Testing Laboratory, Detroit.

Chemists, Metallurgical.
Detroit Testing Laboratory, Detroit.

Chemists, Mining.
Detroit Testing Laboratory, Detroit.

Chrome Brick.
Harbison - Walker Refractories Co., Pittsburg

Chucks, Drill and Lathe.
American Tool Works Co., Cincinnati.
John Bertram & Sons Co., Dundas, Ont.
Canada Machinery Agency, Montreal.
Cleveland Twist Drill Co., Cleveland
Frothingham & Workman, Ltd., Montreal
Hamilton Tool Co., Hamilton, Ont.
Ker & Goodwin, Brantford.
London Mach. Tool Co., Hamilton.
John Millen & Son, Ltd., Montreal.
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.
Rice Lewis & Son, Toronto.
Standard Tool Co., Cleveland.

Chucks, Planer.
American Tool Works Co., Cincinnati.
Canada Machinery Agency, Montreal.
Niles-Bement-Pond Co., New York.

Chucking Machines.
American Tool Works Co., Cincinnati.
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.
Warner & Swasey Co., Cleveland, Ohio

Circuit Breakers.
Allis-Chalmers-Bullock, Limited, Montreal
Canadian General Electric Co., Toronto.
Canadian Westinghouse Co., Hamilton.
Gas & Electric Power Co., Toronto.

Clippers, Bolt.
Frothingham & Workman Ltd., Montreal
A. B. Jardine & Co., Hespeler, Ont.

Cloth and Wool Dryers.
Dominion Heating and Ventilating Co., Hespeler.
B. Greening Wire Co., Hamilton.
Sheldons Limited, Galt

Coal Boring Machines.
Cumming, J. W., New Glasgow, N.S.

Coal Handling Machinery.
Jeffrey Mfg. Co., Columbus, Ohio

Coal Miners' Tools.
Cumming J. W., New Glasgow, N.S.

Collectors, Pneumatic.
Sheldons Limited, Galt

Compressors, Air.
Allis-Chalmers-Bullock, Limited, Montreal
Canada Foundry Co., Limited, Toronto.
Canada Machinery Agency, Montreal.
Canadian Rand Drill Co., Montreal.
Canadian Westinghouse Co., Hamilton.
Darling Bros., Ltd., Montreal
Detroit Foundry Supply Co., Windsor.
Gas & Electric Power Co., Toronto.
John McDougall, Caledonian Iron Works Co., Montreal
H. W. Petrie, Toronto.
The Smart-Turner Mach. Co., Hamilton.
Hall Engineering Works, Montreal, Que.
London Mach. Tool Co., Hamilton.
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.
Pratt & Whitney Co., Hartford, Conn.
Williams & Wilson, Montreal.

Concentrating Plant.
Allis-Chalmers-Bullock, Montreal.
Greey, Wm. & J. G., Toronto.

Concrete Mixers.
Jeffrey M'f'g. Co., Columbus, Ohio.

Condensers.
Canada Foundry Co., Limited, Toronto.
Canada Machinery Agency, Montreal.
Hall Engineering Works, Montreal.
Smart-Turner Machine Co., Hamilton.
Waterous Engine Co., Brantford.

Confectioners' Machinery.
Greey, Wm. & J. G., Toronto.

Consulting Engineers.
Connor, A. W., Toronto
Hall Engineering Works, Montreal.
Jules De Clercy, Montreal.
Roderick J. Parke, Toronto.
T. Pringle & Son, Montreal.
Taylor, James, Wine Harbor, N.S.

Contractors.
Expanded Metal and Fireproofing Co. Toronto.
Gas & Electric Power Co., Toronto.
Hall Engineering Works, Montreal.
Laurie Engine & Machine Co., Montreal.
Manitoba Iron Works, Winnipeg
John McDougall Caledonian Iron Works Co., Montreal
Robb Engineering Co., Amherst, N.S.
The Smart-Turner Mach. Co., Hamilton.
Steel Trough & Machine Co., Tweed, Ont.

Contractors' Plant.
Allis-Chalmers-Bullock, Montreal.
Manitoba Iron Works, Winnipeg
John McDougall, Caledonian Iron Works Co., Montreal.
Niagara Falls Machine & Foundry Co., Niagara Falls, Ont.

Controllers and Starters Electric Motor.
Allis-Chalmers-Bullock, Montreal.
Canadian General Electric Co., Toronto.
Canadian Westinghouse Co., Hamilton.
Gas & Electric Power Co., Toronto.
T. & H. Electric Co., Hamilton.

Converters, Steel.
Northern Engineering Works, Detroit.

Conveyor Machinery.
Greey, Wm. & J. G., Toronto
Jeffrey Mfg. Co., Columbus, Ohio.
Laurie Engine & Machine Co., Montreal.
Rice Lewis & Son, Toronto
Manitoba Iron Works, Winnipeg
John McDougall Caledonian Iron Works Co., Montreal.
Smart-Turner Machine Co., Hamilton.
Waterous Engine Works Co., Brantford.
Williams & Wilson, Montreal.
Wilson, J. C., & Co., Glenora, Ont.

Conveyors, Chain.
Jeffrey Mfg. Co., Columbus, Ohio

Coping Machines.
John Bertram & Sons Co., Dundas, Ont.
London Mach. Tool Co., Hamilton.
Niles-Bement-Pond Co., New York.

Core Compounds.
Buffalo Foundry Supply Co., Buffalo.
Detroit Foundry Supply Co., Windsor.
Dominion Foundry Supply Co., Montreal
Hamilton Facing Mill Co., Hamilton.

Core Ovens.
Detroit Foundry Supply Co., Windsor.
Dominion Foundry Supply Co., Montreal
Hamilton Facing Mill Co., Hamilton.
Sheldons Limited, Galt

Core Oven Bricks.
Detroit Foundry Supply Co., Windsor.
Dominion Foundry Supply Co., Montreal
Hamilton Facing Mill Co., Hamilton.

Core Sand Cleaners.
Sly, W. W., Mfg. Co., Cleveland

Core Wash.
Detroit Foundry Supply Co., Windsor.
Dominion Foundry Supply Co., Montreal
Hamilton Facing Mill Co., Hamilton.

Counterbores.
Cleveland Twist Drill Co., Cleveland

Couplings.
Manitoba Iron Works, Winnipeg
Owen Sound Iron Works Co., Owen Sound
Wilson, J. C., & Co., Glenora, Ont.

Couplings, Air.
Independent Pneumatic Tool Co., Chicago

Cranes, Electric and Hand Power.
Canada Foundry Co., Limited, Toronto
Canadian Pilling Co., Montreal
Dominion Foundry Supply Co., Montreal
Gas & Electric Power Co., Toronto
Gilmour, J., New York
Hamilton Facing Mill Co., Hamilton.
John McDougall, Caledonian Iron Works Co., Montreal.
Niles-Bement-Pond Co., New York.
Northern Engineering Works, Detroit
Owen Sound Iron Works Co., Owen Sound
Smart-Turner-Machine Co., Hamilton.

Crank Pin.
Sight Feed Oil Pump Co., Milwaukee, Wis.

Crankshafts.
St. Clair Bros., Galt

Crabs.
Frothingham & Workman, Ltd., Montreal

Crank Pin Turning Machine
London Mach. Tool Co., Hamilton.
Niles-Bement-Pond Co., New York.

Cross Head Pin.
Sight Feed Oil Pump Co., Milwaukee, Wis.

Crucibles.
Detroit Foundry Supply Co., Windsor
Dominion Foundry Supply Co., Montreal
Hamilton Facing Mill Co., Hamilton.
Seidel, R. B., Inc. Philadelphia

Crucible Caps
Dominion Foundry Supply Co., Montreal
Hamilton Facing Mill Co., Hamilton.

Crushers, Rock or Ore.
Allis-Chalmers-Bullock, Montreal.
Jeffrey Mfg. Co., Columbus, Ohio.

Cupolas.
Detroit Foundry Supply Co., Windsor
Dominion Foundry Supply Co., Montreal
Gilmour, J., New York.
Hamilton Facing Mill Co., Hamilton.
Northern Engineering Works, Detroit
Sheldons Limited, Galt.

Cupola Blast Gauges.
Dominion Foundry Supply Co., Montreal
Sheldons Limited, Galt

Cupola Blocks.
Detroit Foundry Supply Co., Detroit.
Hamilton Facing Mill Co., Hamilton
Gilmour, J., New York.
Northern Engineering Works, Detroit
Ontario Lime Association, Toronto
Toronto Pottery Co., Toronto

Cupola Blowers.
Canada Machinery Agency, Montreal.
Detroit Foundry Supply Co., Windsor
Dominion Foundry Supply Co., Montreal
Dominion Heating and Ventilating Co., Hespeler
Hamilton Facing Mill Co., Hamilton.
Northern Engineering Works, Detroit
Sheldon's Limited, Galt.

Cutters, Flue
Independent Pneumatic Tool Co., Chicago Ill.

Cutter Grinder Attachment.
Cincinnati Milling Machine Co., Cincinnati

Cutter Grinders, Plain.
Cincinnati Milling Machine Co., Cincinnati

Cutter Grinders, Universal.
Cincinnati Milling Machine Co., Cincinnati

Cutters, Milling.
Becker, Brainard Milling Machine Co. Hyde Park, Mass.
Cleveland Twist Drill Co., Cleveland
Frothingham & Workman Ltd., Montreal
Hamilton Tool Co., Hamilton, Ont.
Owen Machine Tool Co., Springfield, Mass.
Pratt & Whitney Co., Hartford, Conn.
Standard Tool Co., Cleveland.

Cutting-off Machines.
Armstrong Bros. Tool Co., Chicago
John Bertram & Sons Co., Dundas, Ont.
Canada Machinery Agency, Montreal.
London Mach. Tool Co., Hamilton.
H. W. Petrie, Toronto.
Pratt & Whitney Co., Hartford, Conn.

Cutting-off Tools.
Armstrong Bros. Tool Co., Chicago.
London Mach. Tool Co., Hamilton.
H. W. Petrie, Toronto.
Pratt & Whitney, Hartford, Conn.
Rice Lewis & Son, Toronto.
L. S. Starrett Co., Athol, Mass.

Damper Regulators.
Darling Bros., Ltd., Montreal

Dies
Brown, Boggs Co., Hamilton
Canadian Tap & Die Co., Galt
Ferracute Machine Co., Bridgeton, N.J.
Globe Machine & Stamping Co., Cleveland, Ohio.
Hall J. H., & Sons, Brantford

Die Stocks
Canadian Tap & Die Co., Galt
Curtis & Curtis Co., Bridgeport, Conn.
Hart Manufacturing Co., Cleveland, Ohio
Jardine, A. B., & Co., Hespeler, Ont.

Dies, Opening
W. H. Banfield & Sons, Toronto
Globe Machine & Stamping Co., Cleveland Ohio.
Jardine, A. B., & Co., Hespeler, Ont.
Pratt & Whitney Co., Hartford, Conn.

Dies, Sheet Metal.
W. H. Banfield & Sons, Toronto.
Bliss, E. W., Brooklyn, N.Y.
Globe Machine & Stamping Co., Cleveland Ohio

Dies, Threading.
Canadian Tap & Die Co., Galt
Frothingham & Workman, Ltd., Montreal
Hart Mfg. Co., Cleveland
Jardine, A. B., & Co., Hespeler, Ont.
John Millen & Son, Ltd., Montreal.

Draft, Mechanical.
W. H. Banfield & Sons, Toronto.
Butterfield & Co., Rock Island, Que.
A. B. Jardine & Co., Hespeler
Pratt & Whitney Co., Hartford, Conn.
Sheldon's Limited, Galt.

Drawing Instruments.
Rice Lewis & Son, Toronto.

Drawn Steel, Cold.
Greey, Wm. & J. G., Toronto
Union Drawn Steel Co., Hamilton.

Drill Holders.
Armstrong Bros. Tool Co., Chicago

Drilling Machines, Arch Bar.
John Bertram & Sons Co., Dundas, Ont.
London Mach. Tool Co., Hamilton
Niles-Bement-Pond Co., New York.

Drilling Machines, Boiler.
American Tool Works Co., Cincinnati.
John Bertram & Sons Co., Dundas, Ont.
Bickford Drill and Tool Co., Cincinnati.
The Canadian Fairbanks Co., Montreal.
A. B. Jardine & Co., Hespeler, Ont.
London Mach. Tool Co., Hamilton, Ont.
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.
Williams & Wilson, Montreal

Drilling Machines Connecting Rod.
John Bertram & Sons Co., Dundas, Ont.
London Mach. Tool Co., Hamilton.
Niles-Bement-Pond Co., New York.

Drilling Machines, Locomotive Frame.
American Tool Works Co., Cincinnati.
John Bertram & Sons Co., Dundas, Ont.
London Mach. Tool Co., Hamilton, Ont.
Niles-Bement-Pond Co., New York.

Drilling Machines, Multiple Spindle.
American Tool Works Co., Cincinnati.
John Bertram & Sons Co., Dundas, Ont.
Bickford Drill & Tool Co., Cincinnati.
Canada Machinery Agency, Montreal.
London Mach. Tool Co., Hamilton, Ont.
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.
Rice Lewis & Son, Toronto
Williams & Wilson, Montreal.

Drilling Machines, Pneumatic
Canada Machinery Agency, Montreal.
Independent Pneumatic Tool Co., Chicago, Ill.

Drilling Machines, Portable
A. B. Jardine & Co., Hespeler, Ont.
Niles-Bement-Pond Co., New York.

Drilling Machines, Radial.
American Tool Works Co., Cincinnati.
John Bertram & Sons Co., Dundas, Ont.
Bickford Tool & Drill Co., Cincinnati.
The Canadian Fairbanks Co., Montreal.
London Mach. Tool Co., Hamilton.
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.
Williams & Wilson, Montreal.

Drilling Machines, Suspension.
John Bertram & Sons Co., Dundas, Ont.
Canada Machinery Agency, Montreal.
London Mach. Tool Co., Hamilton.
Niles-Bement-Pond Co., New York

Drilling Machines, Turret.
John Bertram & Sons Co., Dundas, Ont
London Mach. Tool Co., Hamilton.
Niles-Bement-Pond Co., New York.

Drilling Machines, Upright.
American Tool Works Co., Cincinnati.
John Bertram & Sons Co., Dundas, Ont
Dwight Slate Machine Co., Hartford
Hamilton Tool Co., Hamilton, Ont.
A. B. Jardine & Co., Hespeler, Ont.
Rice Lewis & Son, Toronto.
London Mach. Tool Co., Hamilton.

BOOK REVIEWS.

HAND BOOK, INTERSTATE IRON & STEEL CO., Chicago—Giving illustrations and tables of shapes, sizes, weights, etc., of their rolled product. Contains index and blank pages at back for notes. For free distribution to those directly interested. Mention Canadian Machinery.

SOURCES AND MANUFACTURE, AND USES AND STATISTICS OF INDUSTRIAL ALCOHOL.—Two bulletins by H. M. Wiley on these subjects, issued by the U. S. Department of Agriculture, Washington, for free distribution. These bulletins give very complete information. Mention Canadian Machinery.

THE STEEL SQUARE.—A practical treatise on the steel square and its application to everyday use, by Fred. T. Hodgson. Published by Frederick J. Drake, Chicago, and supplied in Canada by MacLean Publishing Co., Toronto.

This work is in two volumes, each containing over 230 pages. Both volumes are profusely illustrated, showing different applications of the steel square.

THE USE OF ALCOHOL AND GASOLENE IN FARM ENGINES.—Bulletin by S. M. Woodward, M.S., M.A., issued by the U. S. Department of Agriculture, Washington, for free distribution. The bulletin contains 40 pages and is well illustrated. Mention Canadian Machinery.

TESTS OF INTERNAL COMBUSTION ENGINES ON ALCOHOL FUEL—A very complete report by C. E. Luke, M.S., Ph.D., and S. M. Woodward, M.S., M.A., on this subject, published by the U. S. Department of Agriculture, Washington, for free distribution. Mention Canadian Machinery.

WESTINGHOUSE DIARY.—A very neat diary for 1908 has been issued by the Canadian Westinghouse Co., Hamilton. It is in vest-pocket form, and contains much very useful data in back and front sections. By mentioning Canadian Machinery any readers can secure one of these books from the Canadian Westinghouse Co.

PRACTICAL MECHANICAL DRAWING AND MACHINE DESIGN.—A self educative book, by Chas. Westinghouse. 156 pages, 9x7½, with over 200 illustrations. Published by Frederick J. Drake & Co., Chicago,; and supplied in Canada by the MacLean Publishing Co., Toronto.

This is a book of mechanical drawing instructions and hints ; also containing a section on the design of mechanical devices, such as couplings, gears, pulleys, etc., steam boilers, and steam engines. In the first section are considered drafting tools, geometric constructions, mensuration, development of curves and surfaces, machine drawing, etc.

The book covers its subject very completely.

ENGINEERING WORK SHOP PRACTICE.—By Chas. C. Allen. Containing 254 pages, 5x7½, and 152 illustrations. Published by E. P. Dutton & Co., New York. Price, $1.50.

This appears to be a very excellent work of its kind. It illustrates and describes how to use tools, rather than describing the machines themselves, and, therefore, contains much useful information for the student of this class of work, and for the machine operator. Special attention has been given to the highly accurate methods of measurements now used in the best modern shops, and the various gauges, etc., are described in detail. Developments in milling and grinding are explained somewhat fully. Screw cutting and gear cutting are fully treated.

TWENTIETH CENTURY MACHINE SHOP PRACTICE.—By L. Elliott Brooks. 631 pages, 5x8 ; over 400 illustrations. Published by Frederick J. Drake & Co., Chicago ; and furnished in Canada by MacLean Publishing Co., Toronto. Price, $2.

The first 116 pages of the book are given up to arithmetic, mensuration and applied mechanics, many useful tables and formulas being given ; the next 46 pages are devoted to consideration of the properties of steam, and steam indicator, horse-power and electricity ; then follow sections devoted to measuring devices, machinists' tools, shop tools, machine tools, auxiliary machines, portable tools, miscellaneous tools, plain and spiral indexing machines, notes on steel, gas furnaces, shop hints.

This book is intended for machinists and others coming into direct contact with machine shop tools, and being written in an easily understood style, containing nothing of a very technical nature, it fulfils its mission well.

MACHINE DESIGN.—A manual of practical instruction for the design of machinery for specific purposes, etc., by Chas. S. Griffin, S.B., 186 pages, 9½x6½, well illustrated. Published by American School of Correspondence. Price, $1.50. Supplied by MacLean Publishing Co., Toronto.

As in all the books published by this publishing firm, the theoretical considerations are avoided as much as possible and the practical side of each subject is thoroughly discussed. The book is specially adapted for self instruction. The wording is plain and easily understood, and formulas are very simple.

The plan of the book is this : The general principles and methods of machine design are given. These are then illustrated by and applied to a practical case, the design of an elevator wire-rope drive, which is taken up very fully. The next section classifies machinery and illustrates the modifications necessary for each class, and points out the essential features in the design of each class. The last section is given up to illustrating the design of component parts of machinery, including belts, shafts, gears, couplings, clutches, etc.

CALENDARS FOR 1908.

THE CANADA MACHINERY AGENCY, 298 St. James street, Montreal, with large figures that can be seen across the office. The calendar contains cuts of a few of the machines carried in stock by this company.

THE NATIONAL-ACME MFG. CO.—The calendar for 1908 published by the National-Acme Mfg. Co., Cleveland, Ohio, is a work of art, consisting of twelve sheets in holder. Mention Canadian Machinery in sending for it.

HAMILTON FACING MILLS CO.—A very handsome calendar for 1908 is that of the Hamilton Facing Mills Co., Hamilton. It consists of a lithographed plate, 8x10 inches, on a cream matt, 14x17 inches. It is a copy of the painting by C. J. Thysen.

Niles-Bement-Pond Co., New York.
W. H. Petrie, Toronto.
Williams & Wilson, Montreal.

Drills, Bench.

Hamilton Tool Co., Hamilton, Ont.
London Mach. Tool Co., Hamilton.
Pratt & Whitney Co., Hartford, Conn.

Drills, Blacksmith.

Canada Machinery Agency, Montreal.
Frothingham & Workman, Ltd., Montreal
A. B. Jardine & Co., Hespeler, Ont.
London Mach. Tool Co., Hamilton.
Standard Tool Co., Cleveland.

Drills, Centre.

Cleveland Twist Drill Co., Cleveland
Pratt & Whitney Co., Hartford, Conn.
Standard Tool Co., Cleveland, O.
L. S. Starrett Co., Athol, Mass.

Drills, Coal and Plaster.

Cumming, J. W., New Glasgow, N.S.

Drills, Electric

Canadian Pilling Co., Montreal
Gas & Electric Power Co., Toronto.
Niles-Bement-Pond Co., New York.

Drills, Gang.

American Tool Works Co., Cincinnati.
John Bertram & Sons Co., Dundas, Ont.
Pratt & Whitney Co., Hartford, Conn.

Drills, High Speed.

Wm. Abbott, Montreal.
Cleveland Twist Drill Co., Cleveland
Frothingham & Workman, Ltd., Montreal
Alexander Gibb, Montreal.
Pratt & Whitney Co., Hartford, Conn.
Standard Tool Co., Cleveland, O.

Drills, Hand.

A. B. Jardine & Co., Hespeler, Ont.

Drills, Horizontal.

John Bertram & Sons Co., Dundas, Ont.
Canada Machinery Agency, Montreal.
London Mach. Tool Co., Hamilton.
Niles-Bement-Pond Co., New York.

Drills, Pneumatic.

Allen, John F., New York
Canada Machinery Agency, Montreal.
Independent Pneumatic Tool Co., Chicago, New York
Niles-Bement-Pond Co., New York.

Drills, Radial.

American Tool Works Co., Cincinnati.
John Bertram & Sons Co., Dundas, Ont.
Bickford Drill & Tool Co., Cincinnati
London Mach. Tool Co., Hamilton, Ont.
Niles-Bement-Pond Co., New York.

Drills, Ratchet.

Armstrong Bros. Tool Co., Chicago.
Cleveland Twist Drill Co., Cleveland
Frothingham & Workman, Ltd., Montreal
A. B. Jardine & Co., Hespeler,
Pratt & Whitney Co., Hartford, Conn.
Standard Tool Co., Cleveland.

Drills, Rock.

Allis-Chalmers-Bullock, Montreal.
Canadian Rand Drill Co., Montreal.
Jeffrey Mfg. Co., Columbus, Ohio.

Drills, Sensitive.

American Tool Works Co., Cincinnati.
Canada Machinery Agency, Montreal.
Dwight Slate Machine Co., Hartford.
Niles-Bement-Pond Co., New York

Drills, Twist.

Cleveland Twist Drill Co., Cleveland
Frothingham & Workman, Ltd., Montreal
Alex. Gibb, Montreal.
John Millen & Son, Ltd., Montreal.
Morse Twist Drill and Machine Co., New Bedford, Mass.
Pratt & Whitney Co., Hartford, Conn.
Standard Tool Co., Cleveland.

Drying Apparatus of all Kinds.

Dominion Heating & Ventilating Co., Hespeler
Greey, Wm. & J. G., Toronto
Sheldons Limited, Galt

Dry Kiln Equipment.

Sheldons Limited, Galt

Dry Sand and Loam Facing.

Dominion Foundry Supply Co., Montreal
Hamilton Facing Mill Co., Hamilton.

Dump Cars.

Canada Foundry Co., Limited, Toronto
Dominion Foundry Supply Co., Montreal
Greey, Wm. & J. G., Toronto
Hamilton Facing Mill Co., Hamilton.
Jeffrey Mfg. Co., Columbus, Ohio
Manitoba Iron Works, Winnipeg
John McDougall, Caledonian Iron Works Co., Montreal.
Niles-Bement-Pond Co., New York.
Standard Bearings, Ltd., Niagara Falls.
John McDougall Caledonian Iron Works Co., Montreal
Owen Sound Iron Works Co., Owen Sound
Waterous Engine Co., Brantford.

Duplicate Machinery.

Hall, J. H., & Sons, Brantford

Dust Arresters.

Sly, W. W., Mfg. Co., Cleveland

Dust Separators.

Dominion Heating and Ventilating Co., Hespler.
Greey, Wm. & J. G., Toronto
Sheldon's Limited, Galt.

Dynamos.

Allis-Chalmers-Bullock, Montreal.
Canadian General Electric Co., Toronto.
Canadian Westinghouse Co., Hamilton.
Consolidated Electric Co., Toronto
Electrical Machinery Co., Toronto.
Gas & Electric Power Co., Toronto
Hall Engineering Works, Montreal, Que.
John Millen & Son, Ltd., Montreal.
Packard Electric Co., St. Catharines.
H. W. Petrie, Toronto.
T. & H. Electric Co., Hamilton.

Dynamos—Turbine Driven.

Gas & Electric Power Co. Toronto
Kerr-Turbine Co., Wellsville, N.Y.

Economizer, Fuel.

Dominion Heating & Ventilating Co., Hespeler

Electrical Instruments.

Canadian Westinghouse Co., Hamilton.
Gas & Electric Power Co., Toronto.

Electrical Supplies.

Canadian General Electric Co., Toronto.
Canadian Westinghouse Co., Hamilton.
Gas & Electric Power Co., Toronto
London Mach. Tool Co., Hamilton, Ont.
John Millen & Son, Ltd., Montreal.
Packard Electric Co., St. Catharines.
T. & H. Electric Co., Hamilton.

Electrical Repairs

Canadian Westinghouse Co., Hamilton.
T. & H. Electric Co., Hamilton.

Elevators.

Jeffrey Mfg. Co., Columbus, Ohio

Elevator Buckets.

Greey, Wm. & J. G., Toronto
Jeffrey Mfg. Co., Columbus, Ohio.
Manitoba Iron Works, Winnipeg

Emery and Emery Wheels.

Dominion Foundry Supply Co., Montreal
Frothingham & Workman Ltd., Montreal
Hamilton Facing Mill Co., Hamilton.

Emery Wheel Dressers.

Canada Machinery Agency, Montreal.
Dominion Foundry Supply Co., Montreal
Frothingham & Workman Ltd., Montreal
Hamilton Facing Mill Co., Hamilton.
John Millen & Son, Ltd., Montreal.
H. W. Petrie, Toronto.
Standard Tool Co., Cleveland.

Engineers and Contractors.

Canada Foundry Co., Limited, Toronto.
Darling Bros., Ltd., Montreal
Gas & Electric Power Co., Toronto.
Greey, Wm. & J. G., Toronto
Hall Engineering Works, Montreal.
Laurie Engine & Machine Co., Montreal.
Manitoba Iron Works, Winnipeg
John McDougall, Caledonian Iron Works Co., Montreal.
Robb Engineering Co., Amherst, N.S.
The Smart-Turner Mach. Co., Hamilton.

Engineers' Supplies.

Frothingham & Workman, Ltd., Montreal
Greey, Wm. & J. G., Toronto
Hall Engineering Works, Montreal.
Rice Lewis & Son, Toronto.

Engines, Gas and Gasoline.

Canada Foundry Co., Toronto.
Canada Machinery Agency, Montreal.
The Canadian Fairbanks Co., Montreal.
Gas & Electric Power Co., Toronto
Gilson Mfg. Co., Guelph
The Goldie & McCulloch Co., Galt, Ont.
Jones & Glassco, Montreal
Rice Lewis & Son, Toronto
Ontario Wind Engine & Pump Co., Toronto
H. W. Petrie, Toronto.
The Smart-Turner Mach. Co., Hamilton

Engines, Oil.

Jones & Glassco, Montreal

Engines, Steam.

Allis-Chalmers-Bullock, Montreal
Belliss & Marcom, Birmingham, Eng
Canada Machinery Agency, Montreal.
The Goldie & McCulloch Co., Galt, Ont.
Rice Lewis & Son, Toronto.
Laurie Engine & Machine Co., Montreal.
Gas & Electric Power Co., Toronto.
John McDougall Caledonian Iron Works, Montreal.
Robb Engineering Co., Amherst, N.S.
Sheldons Limited, Galt.
The Smart-Turner Mach. Co., Hamilton.
Waterous Engine Works Co., Brantford.

Excavating Machinery.

Jeffrey Mfg. Co., Columbus, Ohio

Exhaust Heads.

Darling Bros., Ltd., Montreal.
Dominion Heating & Ventilating Co., Hespeler
Sheldons Limited, Galt, Ont.

Expanded Metal.

Expanded Metal and Fireproofing Co. Toronto

Expanders.

A. B. Jardine & Co., Hespeler, Ont.

Fans, Electric.

Canadian General Electric Co., Toronto.
Canadian Westinghouse Co., Hamilton.
Dominion Heating & Ventlating Co. Hespeler
Gas & Electric Power Co., Toronto.
Sheldons Limited, Galt, Ont.
The Smart-Turner Mach. Co., Hamilton.

Fans, Exhaust.

Detroit Foundry Supply Co., Windsor.
Dominion Foundry Supply Co., Montreal
Dominion Heating & Ventilating Co., Hespeler.
Gas & Electric Power Co., Toronto.
Greey, Wm. & J. G., Toronto
Hamilton Facing Mill Co., Hamilton.
Sheldons Limited, Galt.

Feed Water Heaters.

Darling Bros., Montreal
Laurie Engine & Machine Co., Montreal
Manitoba Iron Works, Winnipeg
John McDougall, Caledonian Iron Works Co., Montreal.
The Smart-Turner Mach. Co., Hamilton

Files and Rasps.

Frothingham & Workman, Ltd., Montreal
John Millen & Son, Ltd., Montreal.
Rice Lewis & Son, Toronto.
Nicholson File Co., Port Hope
H. W. Petrie, Toronto
Simonds Canada Saw Co., Montreal

Fillet, Pattern.

Detroit Foundry Supply Co., Windsor.
Dominion Foundry Supp'y Co., Montreal
Hamilton Facing Mill Co., Hamilton.

Fire Apparatus.

Waterous Engine Works Co., Brantford.

Fire Brick and Clay.

Detroit Foundry Supply Co., Windsor.
Dominion Foundry Supply Co., Montreal
Gilmour, J., New York
Harbison - Walker Refractories Co., Pittsburg
Manitoba Iron Works, Winnipeg
Maurer, Henry, & Son, New York
Hamilton Facing Mill Co., Hamilton
Ontario Lime Association, Toronto
Toronto Pottery Co., Toronto

Fireproofing Hollowtile.

Maurer Henry, & Son, New York

Flour Mill Machinery.

Allis-Chalmers-Bullock, Montreal.
Greey, Wm. & J. G. Toronto
The Goldie & McCulloch Co., Galt, Ont.
John McDougall, Caledonian Iron Works Co., Montreal.

Forges.

Canada Foundry Co., Limited, Toronto.
Frothingham & Workman Ltd., Montreal
Hamilton Facing Mill Co., Hamilton.
Independent Pneumatic Tool Co., Chicago, Ill.
H. W. Petrie, Toronto.
Sheldons Limited, Galt, Ont.

Forgings, Drop.

John McDougall, Caledonian Iron Works Co., Montreal.
H. W. Petrie, Toronto.
St. Clair Bros., Galt
Wilson J. C. & Co. Glenora, Ont.

Forgings, Light & Heavy.

Hamilton Steel & Iron Co., Hamilton
Manitoba Iron Works, Winnipeg

Forging Machinery.

John Bertram & Sons Co., Dundas, Ont.
London Mach. Tool Co., Hamilton, Ont
National Machinery Co., Tiffin, Ohio
Niles-Bement-Pond Co., New York.

Founders.

Greey, Wm. & J. G., Toronto
Manitoba Iron Works, Winnipeg
John McDougall, Caledonian Iron Works Co., Montreal
Maxwell, David, & Sons, St. Marys
Niagara Falls Machinery & Foundry Co., Niagara Falls, Ont.
The Smart-Turner Mach. Co., Hamilton.
Wilson J. C., & Co., Glenora, Ont.

Foundry Coke.

Baird & West, Detroit

Foundry Equipment.

Ph. Bonvillain & E. Ronceray, Philadelphia
Detroit Foundry Supply Co., Windsor.
Dominion Foundry Supply Co., Montreal
Gilmour, J., New York.

Hamilton Facing Mill Co., Hamilton
Northern Engineering Works, Detroit

Foundry Parting.

Doggett, Stanley, New York
Dominion Foundry Supply Co., Montreal
Partomol Co., New York
Foundry Specialty Co., Cincinnati
Stanley Doggett, New York

Foundry Facings.

Detroit Foundry Supply Co., Windsor.
Doggett Stanley, New York
Dominion Foundry Supply Co., Montreal
Hamilton Facing Mill Co., Hamilton.

Friction Clutch Pulleys, etc.

The Goldie & McCulloch Co., Galt.
Greey, Wm. & J. G., Toronto
Link-Belt Co., Philadelphia.
Manitoba Iron Works, Winnipeg

Furnaces.

Detroit Foundry Supply Co., Windsor.
Dominion Foundry Supply Co., Montreal
Hamilton FacinMill Co., Hamilton.
Northern Engineering Works, Detroit

Gang Planer Tools.

Armstrong Bros. Tool Co., Chicago

Gas Blowers and Exhausters.

Dominion Heating & Ventilating Co. Hespeler
Sheldons Limited, Galt.

Gas Furnaces.

Chicago Flexible Shaft Co., Chicago

Gas Plants, Suction and Pressure.

Gas & Electric Power Co., Toronto
Williams & Wilson, Montreal

Gauges, Standard.

Cleveland Twist Drill Co., Cleveland
Pratt & Whitney Co., Hartford, Conn.

Gearing.

Greey, Wm. & J. G. Toronto
Manitoba Iron Works, Winnipeg
Wilson, J. C., & Co., Glenora Ont.

Gear Cutting Machinery.

Becker - Brainard Milling Mach. Co. Hyde Park, Mass.
Bickford Drill & Tool Co., Cincinnati.
Dwight Slate Machine Co., Hartford
Greey, Wm. & J. G., Toronto
Kennedy Wm., & Sons, Owen Sound
London Mach. Tool Co., Hamilton.
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.
Pratt & Whitney Co., Hartford, Conn.
Williams & Wilson, Montreal.
Wilson, J. C. & Co., Glenora, Ont.

Gears, Angle.

Greey, Wm. & J. G. Toronto
Laurie Engine & Machine Co., Montreal.
Manitoba Iron Works, Winnipeg
John M. Dougall, Caledonian Iron Works Co., Montreal.
Waterous Engine Co., Brantford
Wilson, J. C., & Co., Glenora, Ont.

Gears, Cut.

Horsburgh & Scott Co., Cleveland
Kennedy, Wm., & Sons, Owen Sound
Wilson, J. C., & Co., Glenora, Ont.

Gears, Iron.

Greey, Wm. & J. G., Toronto
Kennedy, Wm., & Sons, Owen Sound
Manitoba Iron Works, Winnipeg
Wilson, J. C., & Co., Glenora, Ont

Gears, Mortise.

Greey, Wm. & J. G., Toronto
Kennedy, Wm. & Sons, Owen Sound
Manitoba Iron Works, Winnipeg
Wilson, J. C., & Co. Glenora, Ont.

Gears, Rawhide.

Horsburgh & Scott Co., Cleveland

Gears, Reducing.

Brown, David & Sons, Huddersfield, Eng
Greey, Wm. & J. G., Toronto
John McDougall, Caledonian Iron Works Co., Montreal
Wilson, J. C., & Co., Glenora Ont

Gears, Worm.

Horsburgh & Scott Co., Cleveland
Wilson J. C., & Co., Glenora Ont.

Gears and Pinions.

Manitoba Iron Works, Winnipeg
Wilson, J. C., & Co., Glenora, Ont

Generators, Electric.

Allis-Chalmers-Bullock, Limited, Montreal
Canadian General Electric Co., Toronto
Canadian Westinghouse Co., Hamilton.
Gas & Electric Power Co., Toronto
Hall Engineering Works, Montreal.
H. W. Petrie, Toronto.
Toronto & Hamilton Electric Co. Hamilton.

Governors, Water Wheel.

Wilson, J. C., & Co., Glenora, Ont.

Graphite Paints.

P. D. Dods & Co., Montreal.

Graphite.

Detroit Foundry Supply Co., Windsor.
Doggett, Stanley, New York
Dominion Foundry Supply Co., Montreal
Hamilton Facing Mill Co., Hamilton.

Grinders, Automatic Knife.

W. H. Banfield & Son, Toronto.

Grinders, Bench.

Hall, J. H., & Sons, Brantford.

Grinders, Centre.

Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.

Grinders, Cutter.

Becker-Brainard Milling Mach. Co., Hyde Park, Mass.
John Millen & Son, Ltd., Montreal.
Pratt & Whitney Co., Hartford, Conn.

Grinders, Disc.

Armstrong Bros. Tool Co, Chicago

Grinders, Tool.

Armstrong Bros. Tool Co., Chicago.
Blount, J. G., & Co., Everett, Mass.
Gisholt Machine Co., Madison, Wis.
H. W. Petrie, Toronto.
Williams & Wilson, Montreal.

Grinders, Pedestal.

Hall, J. H., & Sons, Brantford.

Grinding Holders.

Armstrong Bros. Tool Co, Chicago

Grinding Machines.

Bath Grinder Co., Fitchburg, Mass.
The Canadian Fairbanks, Montreal.
Independent Pneumatic Tool Co., Chicago, Ill.
Rice Lewis & Son, Toronto.
Niles-Bement-Pond Co., New York.
Simonds Canada Saw Co., Montreal
H. W. Petrie, Toronto.

Grinding & Polishing Machines

Blount, J. G., & Co., Everett, Mass.
The Canadian Fairbanks Co., Montreal.
Greey, Wm. & J. G., Toronto
Independent Pneumatic Tool Co., Chicago, Ill.
John Millen & Son, L'td., Montreal.
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.

Grinding Wheels

Carborundum Co., Niagara Falls
Norton Company, Worcester, Mass.

Hack Saws.

Canada Machinery Agency, Montreal.
The Canadian Fairbanks Co., Montreal.
Frothingham & Workman, Ltd., Montrea
John Millen & Son, Ltd., Montreal.
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.
Simonds Canada Saw Co., Montreal
Williams & Wilson, Montreal.

Hack Saw Frames.

Simonds Canada Saw Co., Montreal.

Hammers, Drop.

London Mach. Tool Co., Hamilton, Ont
Niles-Bement-Pond Co., New York.

Hammers, Steam.

John Bertram & Sons Co., Dundas, Ont.
London Mach. Tool Co., Hamilton, Ont.
Niles-Bement-Pond Co., New York.

Hand Stocks.

Borden-Canadian Co., Toronto
Canadian Tap & Die Co., Galt.
A. B. Jardine & Co., Hespeler, Ont.

Hangers.

Fay, J. A., & Egan Co., Cincinnati
The Goldie & McCulloch Co., Galt.
Greey, Wm. & J. G., Toronto
Kennedy, Wm., & Sons, Owen Sound
Manitoba Iron Works, Winnipeg.
Owen Sound Iron Works Co., Owen Sound
The Smart-Turner Mach. Co., Hamilton.
Waterous Engine Co., Brantford.
Wilson, J. C., & Co., Glenora, Ont.

Heating Apparatus.

Darling Bros., Ltd., Montreal
Dominion Heating & Ventilating Co., Hespeler
Sheldons Limited, Galt.

Hoisting and Conveying Machinery.

Allis-Chalmers-Bullock, Limited, Montreal.
Greey, Wm & J. G., Toronto
Jeffrey Mfg. Co., Columbus, Ohio.
Manitoba Iron Works, Winnipeg.
Niles-Bement-Pond Co., New York.
Northern Engineering Works, Detroit
The Smart-Turner Mach. Co., Hamilton.
Waterous Engine Co., Brantford.
Wilson, J. C., & Co., Glenora, Ont.

Hoists, Electric.

Northern Engineering Works, Detroit

Hoists, Pneumatic.

Canadian Rand Drill Co., Montreal.
Dominion Foundry Supply Co., Montreal
Hamilton Facing Mill Co., Hamilton.
Northern Engineering Works, Detroit

Hoists, Portable & Stationary.

Canadian Pilling Co., Montreal

Hose, Air.

Canadian Rand Drill Co., Montreal.
Canadian Westinghouse Co., Hamilton.
Independent Pneumatic Tool Co., Chicago

Hose Couplings.

Canadian Rand Drill Co., Montreal.
Canadian Westinghouse Co., Hamilton.

Hose, Steam.

Allis-Chalmers-Bullock, Montreal.
Canadian Rand Drill Co., Montreal.
Canadian Westinghouse Co., Hamilton.
Independent Pneumatic Tool Co., Chicago, Ill.

Hydraulic Accumulators.

Ph. Bonvillain & E. Ronceray, Philadelphia
Niles-Bement-Pond Co, New York.
Perrin, Wm. R., Co., Toronto.
The Smart-Turner Mach. Co., Hamilton.

Hydraulic Machinery.

Allis-Chalmers-Bullock, Montreal
Gas & Electric Power Co., Toronto.
Wilson, J. C., & Co., Glenora, Ont.

India Oil Stones.

Norton Company, Worcester, Mass.

Indicators, Speed.

L. S. Starrett Co., Athol, Mass.

Injectors.

Canada Foundry Co., Toronto.
The Canadian Fairbanks Co., Montreal.
Desmond-Stephan Mfg. Co., Urbana, Ohio
Frothingham & Workman, Ltd., Montreal
Rice Lewis & Son, Toronto.
Penberthy Injector Co., Windsor, Ont.

Iron and Steel.

Frothingham & Workman, Ltd., Montreal

Iron and Steel Bars and Bands.

Hamilton Steel & Iron Co. Hamilton

Iron Cements.

Detroit Foundry Supply Co., Windsor.
Dominion Foundry Supply Co. Montreal
Hamilton Facing Mill Co., Hamilton.

Iron Filler.

Detroit Foundry Supply Co., Windsor.
Dominion Foundry Supply Co., Montreal
Hamilton Facing Mill Co., Hamilton.

Jacks.

Frothingham & Workman, Ltd., Montreal
Norton, A. O., Coaticook, Que.

Jigs.

Hall, J. H., & Sons, Brantford.

Kegs, Steel Shop.

Cleveland Wire Spring Co., Cleveland

Ladles, Foundry.

Dominion Foundry Supply Co., Montreal
Frothingham & Workman Ltd., Montreal
Northern Engineering Works, Detroit

Lamps, Arc and Incandescent.

Canadian General Electric Co., Toronto.
Canadian Westinghouse Co., Hamilton.
Gas & Electric Power Co., Toronto
The Packard Electric Co., St. Catharines.

Lathe Dogs.

Armstrong Bros. Tool Co., Chicago
Pratt & Whitney Co., Hartford, Conn.

Lathes, Engine.

American Tool Work Co., Cincinnati.
John Bertram & Sons Co., Dundas, Ont.
Canada Machinery Agency, Montreal.
The Canadian Fairbanks Co., Montreal.
London Mach. Tool Co., Hamilton, Ont.
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.
Rice Lewis & Son Toronto
Pratt & Whitney Co., Hartford, Conn.

Lathes, Foot-Power.

American Tool Works Co., Cincinnati.

Lathes, Screw Cutting.

Niles-Bement-Pond Co., New York.

Lathes, Automatic, Screw-Threading.

John Bertram & Sons Co., Dundas, Ont
London Mach. Tool Co., Hamilton, Ont
Pratt & Whitney Co., Hartford, Conn.

Lathes, Bench.

Blount, J. G. & Co., Everett, Mass.
London Mach. Tool Co., London, Ont.
Pratt & Whitney Co., Hartford, Conn.

Lathes, Speed.

Blount, J. G., & Co, Everett, Mass.

Lathes, Turret.

American Tool Works Co., Cincinnati.
John Bertram & Sons Co., Dundas, Ont.
Blount, J. G. & Co., Everett, Mass.
Gisholt Machine Co., Madison, Wis.
London Mach. Tool Co., Hamilton, Ont.
Niles-Bement-Pond Co., New York.
The Pratt & Whitney Co., Hartford, Conn.
Warner & Swasey Co., Cleveland, O.

Leather Belting.

Canada Machinery Agency, Montreal.
The Canadian Fairbanks Co., Montreal
Greey, Wm. & J. G., Toronto

Link Belting.

Jeffrey Mfg Co., Columbus, Ohio.

Locomotives, Air.

Canadian Rand Drill Co., Montreal.

Locomotives, Electrical.

Canadian Westinghouse Co., Hamilton
Gas & Electric Power Co., Toronto
Jeffrey Mfg. Co., Columbus, Ohio.

Locomotives, Industrial.

Jeffrey Mfg Co, Colembu, Ohio.

Locomotives, Steam.

Canada Foundry Co., Toronto.
Canadian Rand Drill Co., Montreal

Locomotive Turntable Tractors.

Canadian Pilling Co., Montreal

Lubricating Plumbago.

Detroit Foundry Supply Co., Detroit.
Dominion Foundry Supply Co., Montreal
Hamilton Facing Mill Co., Hamilton.

Lubricators, Force Feed.

Sight Feed Oil Pump Co., Milwaukee, Wis

Lumber Dry Kilns.

Dominion Heating & Ventilating Co., Hespeler.
H. W. Petrie, Toronto.
Sheldons Limited, Galt, Ont.

Machinery Dealers.

Canada Machinery Agency, Montreal.
The Canadian Fairbanks Co., Montreal.
Rice Lewis & Son, Toronto
H. W. Petrie, Toronto.
The Smart-Turner Mach. Co., Hamilton.
Williams & Wilson Montreal.

Machinery Designers.

Greey, Wm. & J. G., Toronto
Wilson, J. C., & Co., Glenora, Ont.

Machinists.

W. H. Banfield & Sons, Toronto.
Greey, Wm. & J. G. Toronto
Hall Engineering Works Montreal.
Manitoba Iron Works, Winnipeg
John McDougall, Caledonian Iron Works Co., Montreal.
Paxson, J. W., Co, Philadelphia
Robb Engineering Co., Amherst, N.S.
The Smart-Turner Mach. Co., Hamilton.
Waterous Engine Co., Brantford.
Wilson, J. C., & Co., Glenora, Ont.

Machinists' Small Tools.

Armstrong Bros. Tool Co., Chicago.
Butterfield & Co., Rock Island, Que.
Canadian Tap & Die Co., Galt.
Cleveland Twist Drill Co., Cleveland
Frothingham & Workman, Ltd., Montreal
Jardine, A. B., & Co., Hespeler, Ont.
Rice Lewis & Son, Montreal.
Pratt & Whitney Co., Hartford, Conn.
Standard Tool Co., Cleveland.
L. S. Starrett Co., Athol, Mass.
Williams & Wilson, Montreal.

Magnesia Brick.

Harbison-Walker Refractories Co., Pittsburg.

Malleable Flask Clamps.

Dominion Foundry Supply Co., Montreal

Malleable Iron Castings.

Galt Malleable Iron Co., Galt
Jeffrey Mfg. Co., Columbus, Ohio.

Mandrels.

Cleveland Twist Drill Co, Cleveland
A. B. Jardine & Co., Hespeler, Ont.
The Pratt & Whitney Co., Hartford, Conn.
Standard Tool Co., Cleveland.

Mallet, Rawhide and Wood.

Detroit Foundry Supply Co., Detroit.
Dominion Foundry Supply Co., Montreal

Maple Cogs, Blank Face.

Wilson J. C., & Co., Glenora, Ont.

Maple Cogs, Machine Dressed.

Wilson, J. C., & Co., Glenora Ont.

Marking Machines.

Dwight Slate Machine Co, Hartford,

Metallic Paints.

P. D. Dods & Co., Montreal.

Meters, Electrical.

Canadian Westinghouse Co., Hamilton.
Gas & Electric Power Co., Toronto.

Mill Machinery.

Greey Wm. & J. G., Toronto
The Goldie & McCulloch Co., Galt, Ont.
John McDougall, Caledonian Iron Works Co., Montreal.
H. W. Petrie, Toronto.
Robb Engineering Co., Amherst, N.S.
Waterous Engine Co., Brantford.
Williams & Wilson, Montreal.
Wilson, J. C., & Co. Glenora, Ont.

Milling Attachments.

Becker-Brainard Milling Machine Co. Hyde Park, Mass.
John Bertram & Sons Co., Dundas, Ont.
Cincinnati Milling Machine Co., Cincinnati.
Kearney & Trecker Co., Milwaukee, Wis.
Niles-Bement-Pond Co., New York.
Owen Machine Tool Co., Springfield, Mass.
Pratt & Whitney, Hartford, Conn.

Milling Machines, Horizontal.

Becker-Brainard Milling Machinery Co. Hyde Park, Mass.
John Bertram & Sons Co., Dundas, Ont.
London Mach. Tool Co., Hamilton, Ont.
Niles-Bement-Pond Co., New York.
Pratt & Whitney, Hartford, Conn.

Milling Machines, Motor Driven.

Cincinnati Milling Machine Co., Cincinnati

Milling Machines, Plain.

American Tool Works Co., Cincinnati.
Becker-Brainard Milling Machine Co. Hyde Park, Mass.
John Bertram & Sons Co., Dundas, Ont.
Canada Machinery Agency, Montreal.
The Canadian Fairbanks Co., Montreal.
Cincinnati Milling Machine Co., Cincinnati
Kearney & Trecker Co., Milwaukee, Wis.
London Mach. Tool Co., Hamilton, Ont.
Niles-Bement-Pond Co., New York.
Owen Machine Tool Co., Springfield, Mass.
H. W. Petrie, Toronto.
Pratt & Whitney Co., Hartford, Conn.
Williams & Wilson, Montreal.

Milling Machines, Universal.

American Tool Works Co., Cincinnati.
Becker-Brainard Milling Machine Co., Hyde Park, Mass.
John Bertram & Sons Co., Dundas, Ont.
Canada Machinery Agency, Montreal.
The Canadian Fairbanks Co., Montreal.
Cincinnati Milling Machine Co., Cincinnati
Kearney & Trecker Co., Milwaukee, Wis.
London Mach. Tool Co., Hamilton, Ont
Niles-Bement-Pond Co., New York.
Owen Machine Tool Co., Springfield, Mass.
H. W. Petrie, Toronto.
Williams & Wilson, Montreal.

Milling Machines, Vertical.

Becker-Brainard Milling Machine Co., Hyde Park, Mass.
John Bertram & Sons Co., Dundas, Ont.
Canada Machinery Agency, Montreal.
Kearney & Trecker Co., Milwaukee, Wis.
London Mach. Tool Co., Hamilton, Ont.
Niles-Bement-Pond Co., New York.

Milling Tools.

Wm. Abbott, Montreal.
Becker-Brainard Milling Machine Co., Hyde Park, Mass.
Geometric Tool Co., New Haven, Conn.
Hamilton Tool Co., Hamilton, Ont.
London Mach. Tool Co., Hamilton, Ont.
Owen Machine Tool Co., Springfield, Mass.
Pratt & Whitney Co., Hartford, Conn.
Standard Tool Co., Cleveland.

Mine Cars and Hitchings.

Cumming, J. W., New Glasgow N.S.
Hamman Steel Car & Engineering Works, Hamilton.
Manitoba Iron Works, Winnipeg.

Miners' Copper Needles and Stemmers.

Cumming, J. W., New Glasgow, N.S.

Mining Machinery.
Allis-Chalmers-Bullock, Limited, Montreal
Canadian Rand Drill Co., Montreal.
Gas & Electric Power Co., Toronto.
Jeffrey Mfg. Co., Columbus, Ohio.
Laurie Engine & Machine Co., Montreal.
Rice Lewis & Son, Toronto.
John McDougall, Caledonian Iron Works Co., Montreal.
T. & H. Electric Co. Hamilton.

Mixing Machines, Dough.
Greey, Wm. & J. G., Toronto

Mixing Machines, Special.
Greey, Wm. & J. G., Toronto

Model Tools.
Globe Machine & Stamping Co, Cleveland, Ohio.
Wells Pattern and Model Works, Toronto

Motors, Electric.
Allis-Chalmers-Bullock Limited, Montreal
Canadian General Electric Co., Toronto
Canadian Westinghouse Co., Hamilton.
Consolidated Electric Co Toronto
Electrical Machinery Co., Toronto.
Gas & Electric Power Co., Toronto
Hall Engineering Works, Montreal.
The Packard Electric Co., St. Catharines.
T. & H. Electric Co., Hamilton.

Motors, Air.
Canadian Rand Drill Co., Montreal.

Molders' Supplies.
Detroit Foundry Supp'y Co., Windsor.
Dominion Foundry Supply Co., Montreal
Hamilton Facing Mill Co., Hamilton

Molders' Tools.
Detroit Foundry Supply Co., Windsor
Dominion Foundry Supply Co., Montreal
Hamilton Facing Mill Co., Hamilton.

Molding Machines.
P. Bonvillain & E. Ronceray, Philadelphia
Buffalo Foundry Supply Co. Buffalo.
Dominion Foundry Supply Co., Montreal
Hamilton Facing Mill Co., Hamilton.

Molding Sand.
T. W. Barnes, Hamilton.
Detroit Foundry Supply Co., Windsor
Dominion Foundry Supply Co., Montreal
Hamilton Facing Mill Co., Hamilton.

Nut Tappers.
John Bertram & Sons Co., Dundas, Ont
A. B. Jardine & Co., Hespeler.
London Mach. Tool Co., Hamilton.
National Machinery Co., Tiffin, Ohio.

Nuts.
Canada Nut Co., Toronto

Oatmeal Mill Machinery.
Greey Wm. & J. G., Toronto
The Goldie & McCulloch Co., Galt

Oilers, Gang.
Sight Feed Oil Pump Co., Milwaukee, Wis.

Oils, Core.
Dominion Foundry Supply Co, Montreal
Hamilton Facing Mill Co., Hamilton.

Oil Extractors.
Darling Bros., Ltd., Montreal

Oil Stones.
Carborundum Co., Niagara Falls, N.Y.

Packing Metallic.
Canfield Mfg. Co., Philadelphia

Paint Mill Machinery.
Greey, Wm. & J. G., Toronto

Pans, Lathe.
Cleveland Wire Spring Co., Cleveland

Pans, Steel Shop.
Cleveland Wire Spring Co.. Cleveland

Parting Compound.
Doggett, Stanley, New York
Dominion Foundry Supply Co., Montreal
Partamol Co., New York

Patent Solicitors.
Cousins, C. C., Montreal.
Hanbury A. Budden, Montreal.
Fetherstonhaugh & Co., Montreal and Toronto
Marion & Marion, Montreal.
Ridout & Maybee, Toronto.

Patterns.
Galt Malleable Iron Co., Galt
Hamilton Pattern Works, Hamilton.
John McDougall, Caledonian Iron Works Co., Montreal.
Wells' Pattern and Model Works, Toronto.

Piano Plates.
Crowe's Iron Works, Guelph, Ont.

Pig Iron.
Hamilton Steel & Iron Co., Hamilton

Pipe Cutting and Threading Machines.
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Butterfield & Co., Rock Island, Que.
Canada Machinery Agency, Montreal.
Curtis & Curtis Co, Bridgeport, Conn.
Frothingham & Workman, Ltd., Montreal
Hart Mfg. Co., Cleveland
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Canadian Pipe Co., Vancouver, B.C.
Pacific Coast Pipe Co., Vancouver, B.C.

Pipe, Waterworks.
Canadian Pipe Co., Vancouver, B.C.

Planer Jacks.
Armstrong Bros. Tool Co., Chicago

Planers, Standard.
American Tool Works, Cincinnati.
Bateman's Machine Tool Co., Leeds, Eng.
John Bertram & Sons Co., Dundas, Ont.
Canada Machinery Agency, Montreal.
The Canadian Fairbanks Co., Montreal.
Rice Lewis & Son, Toronto.
London Mach. Tool Co., Hamilton, Ont.
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.
Pratt & Whitney Co., Hartford, Conn.
Williams & Wilson, Montreal.

Planers, Rotary.
John Bertram & Sons Co., Dundas, Ont.
London Mach. Tool Co., Hamilton, Ont.
Niles-Bement-Pond Co.. New York.

Planing Mill Fans.
Dominion Heating & Ventilating Co., Hespeler
Sheldons Limited, Galt, Ont.

Plumbago.
Detroit Foundry Supply Co., Windsor
Doggett, Stanley, New York
Dominion Foundry Supply Co., Montreal
Hamilton Facing Mill Co., Hamilton,

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Allis-Chalmers-Bullock, Montreal.
Canadian Rand Drill Co., Montreal.
Hamilton Facing Mill Co., Hamilton.
Independent Pneumatic Tool Co. Chicago, New York

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Frothingham & Workman, Ltd., Montreal

Power Plants.
Gas & Electric Power Co, Toronto
John McDougall Caledonian Iron Works Co., Montreal.
The Smart-Turner Mach. Co., Hamilton

Power Plant Equipments.
Darling Bros., Ltd., Montreal
Gas & Electric Power Co., Toronto.

Presses, Drop.
W. H. Banfield & Son, Toronto.
E. W. Bliss Co., Brooklyn, N.Y.
Brown, Boggs Co., Hamilton
Canada Machinery Agency, Montreal.
Ferracute Machine Co., Bridgeton, N.J.
Laurie Engine & Machine Co.. Montreal
Niles-Bement-Pond Co., New York.

Presses, Hand.
E. W. Bliss Co., Brooklyn, N.Y.
Brown Boggs Co., Hamilton
Ferracute Machine Co, Bridgeton, N J.

Presses, Hydraulic.
John Bertram & Sons Co., Dundas, Ont.
Laurie Engine & Machine Co., Montreal.
London Mach. Tool Co., Hamilton. Ont.
John McDougall Caledonian Iron Works Co., Montreal.
Niles-Bement-Pond Co.. New York.
Perrin, Wm. R., & Co., Toronto

Presses, Power.
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Brown, Boggs Co. Hamilton
Canada Machinery Agency, Montreal.
Consolidated Press & Tool Co., Hastings, Mich.
Ferracute Machine Co., Bridgeton, N.J.
Laurie Engine & Machine Co., Montreal
London Mach Tool Co, Hamilton. Ont.
John McDougall Caledonian Iron Works Co., Montreal.
Niles-Bement-Pond Co., New York.

Presses Power Screw.
Brown, Boggs Co., Hamilton
Ferracute Machine Co.. Bridgeton, N.J.
Perrin, Wm. R., & Co., Toronto

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Darling Bros., Ltd., Montreal

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Laurie Engine & Machine Co., Montreal.
John McDougall Caledonian Iron Works Co., Montreal.
Waterous Engine Works Co., Brantford

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Canada Machinery Agency, Montreal.
The Canadian Fairbanks Co., Montreal.
Fay, J. A., & Egan Co., Cincinnati
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Greey, Wm. & J. G., Toronto
Laurie Engine & Machine Co., Montreal.
John McDougall Caledonian Iron Works Co., Montreal.
Manitoba Iron Works, Winnipeg.
Owen Sound Iron Works Co., Owen Sound
H. W. Petrie, Toronto.
The Smart-Turner Mach. Co., Hamilton.
Waterous Engine Co., Brantford.
Williams & Wilson, Montreal.
Wilson, J. C., & Co. Glenora, Ont.

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Ontario Wind Engine & Pump Co, Toronto

Pump Governors.
Darling Bros., Ltd. Montreal

Pumps, Hydraulic.
Ph. Bonvillain & E. Ronceray, Philadelphia
Laurie Engine & Machine Co., Montreal
Perrin, Wm. R. & Co., Toronto

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Sight Feed Oil Pump Co., Milwaukee, Wis.

Pumps, Steam.
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Canada Foundry Co., Toronto.
Canada Machinery Agency, Montreal.
Darling Bros., Ltd., Montreal
Gas & Electric Power Co, Toronto
The Goldie & McCulloch Co., Galt.
John McDougall Caledonian Iron Works, Montreal.
Manitoba Iron Works, Winnipeg.
H. W. Petrie, Toronto.
The Smart-Turner Mach. Co., Hamilton.
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Canada Foundry Co., Limited, Toronto
Canada Machinery Agency, Montreal.
Canadian Rand Drill Co., Montreal.
Darling Bros., Ltd., Montreal
Gas & Electric Power Co., Toronto.
Hall Engineering Works, Montreal, Que.
Laurie Engine & Machine Co., Montreal.
London Mach. Tool Co., Hamilton, Ont.
John McDougall Caledonian Iron Works Co., Montreal.
The Smart-Turner Mach. Co., Hamilton

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Ferracute Machine Co., Bridgeton, N.J.
Globe Machine & Stamping Co.
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London Mach Tool Co., Hamilton, Ont.
Pratt & Whitney Co., Hartford, Conn.
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Punches, Power.
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Canada Machinery Agency, Montreal.
Ferracute Machine Co., Bridgeton, N J.
London Mach. Tool Co., Hamilton, Ont.
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Pratt & Whitney Co., Hartford, Conn.
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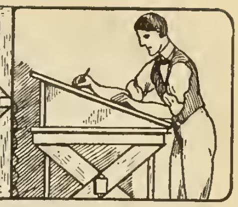

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Wilson, J. C., & Co., Glenora, Ont.

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The Goldie & McCulloch Co.,Galt.
Manitoba Iron Works, Winnipeg.
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Canadian Rand Drill Co., Montreal.
Dominion Foundry Supply Co., Montreal
John Millen & Son, Ltd., Montreal.
Northern Engineering Works, Detroit

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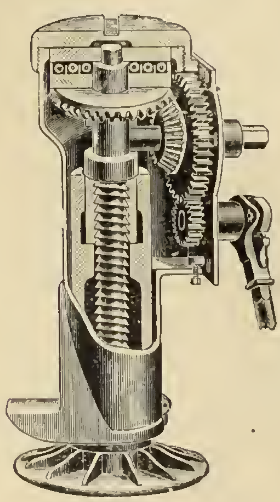
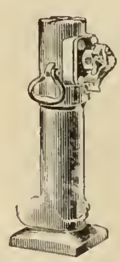


Sectional View of 70-Ton Bridge Jack



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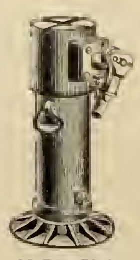

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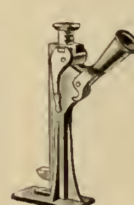

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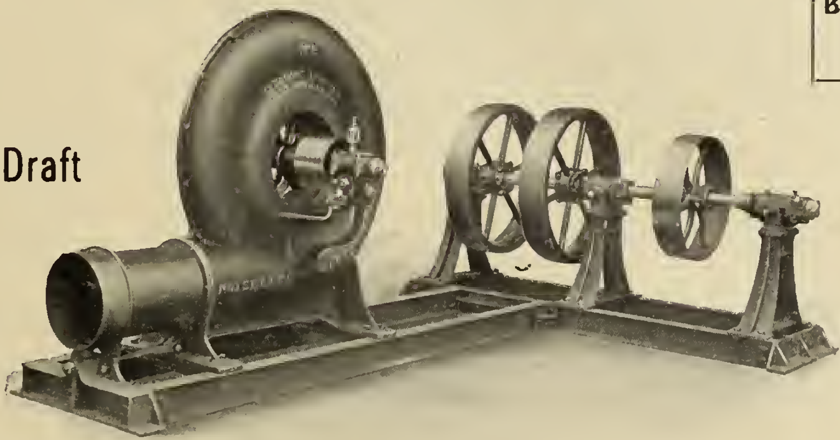

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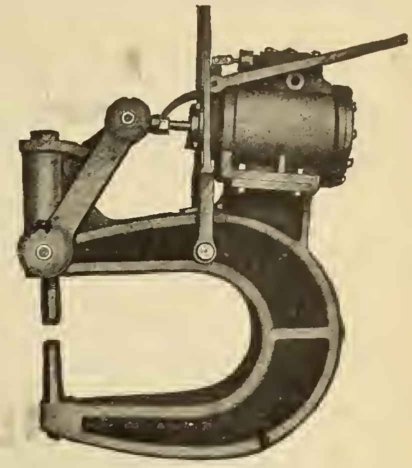

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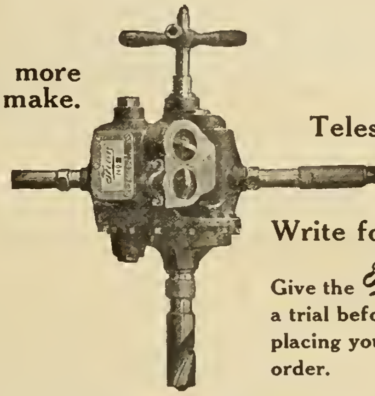

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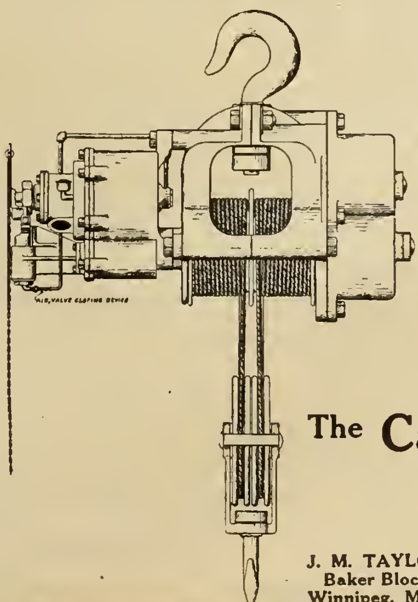

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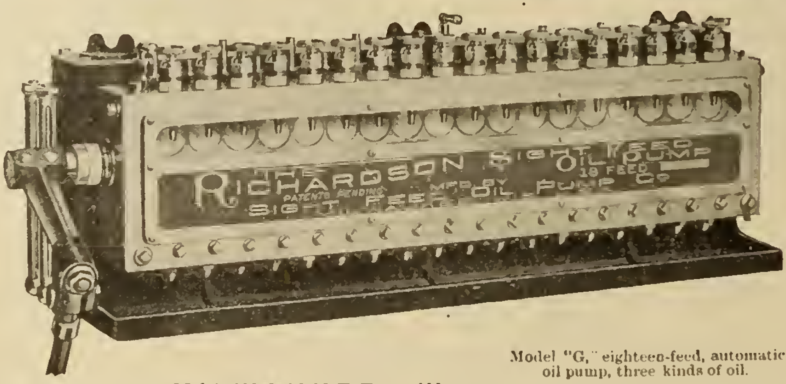

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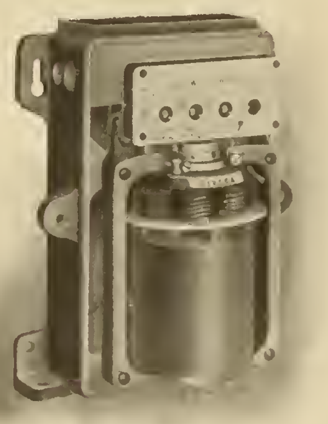

A C. Meter, verified by Dept. of Inland Revenue. Report G. 786, Oct. 4 07

43. Electricity Inspection.

G. 798. 300

Department of Inland Revenue,

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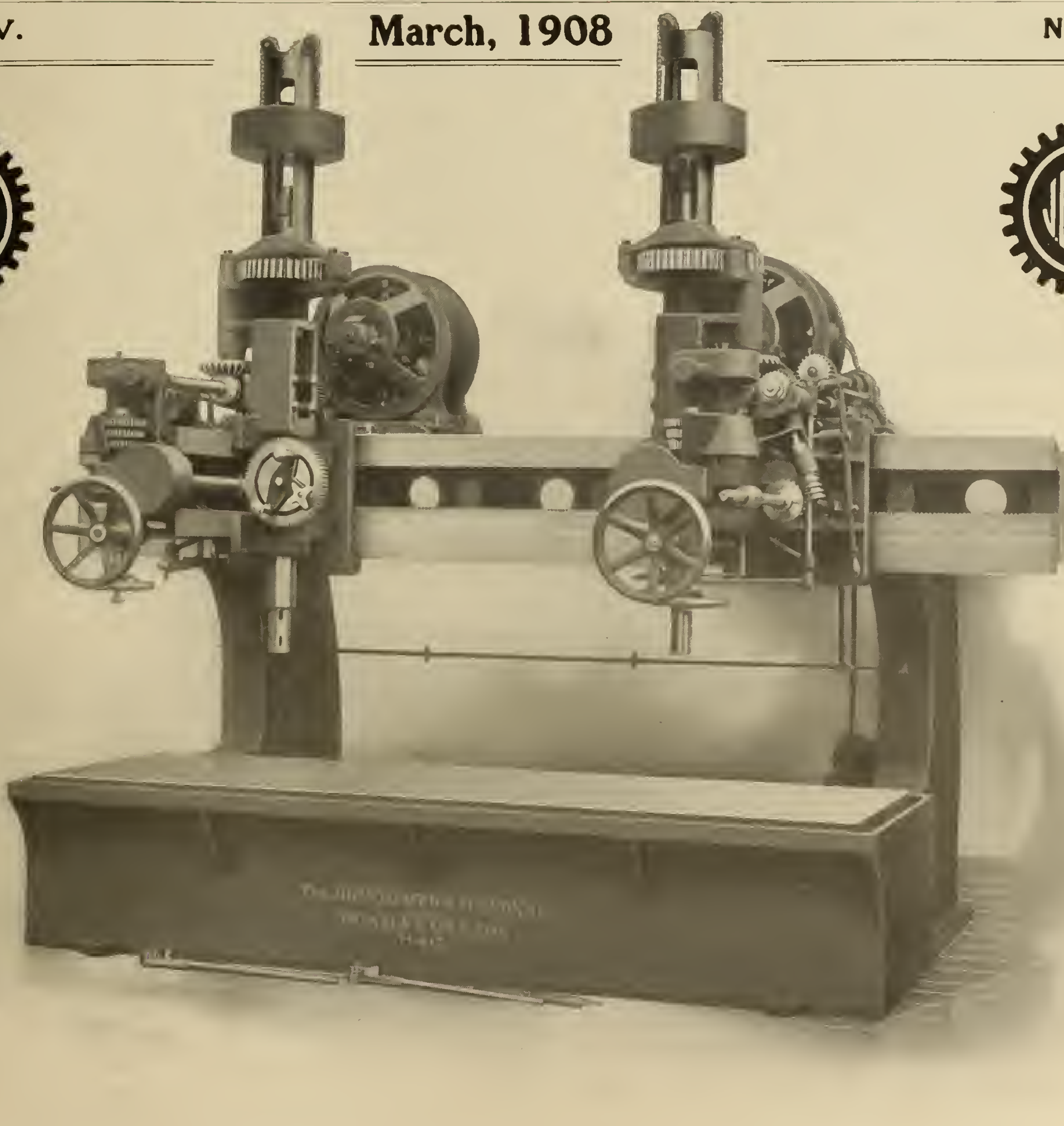
Vol. IV. March, 1908 No. 3



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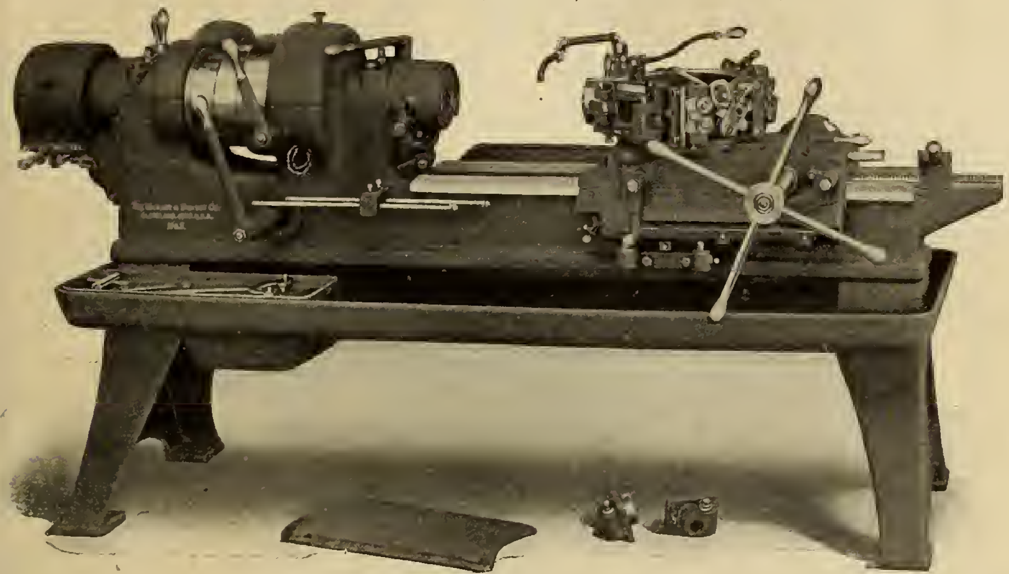

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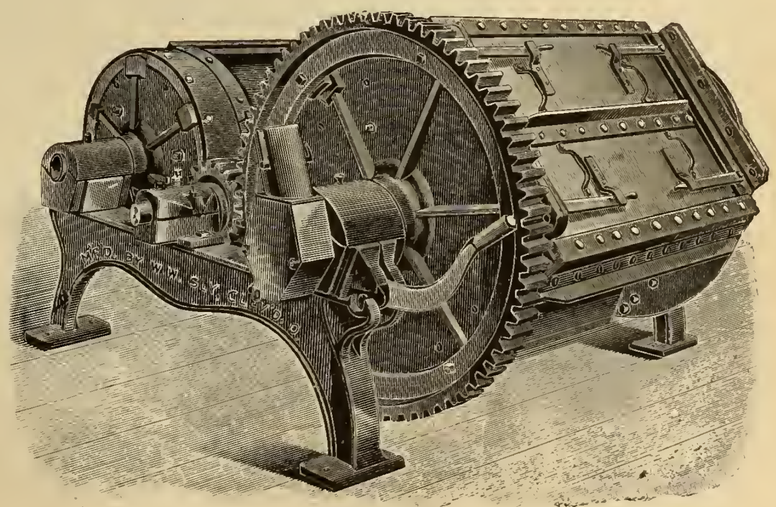

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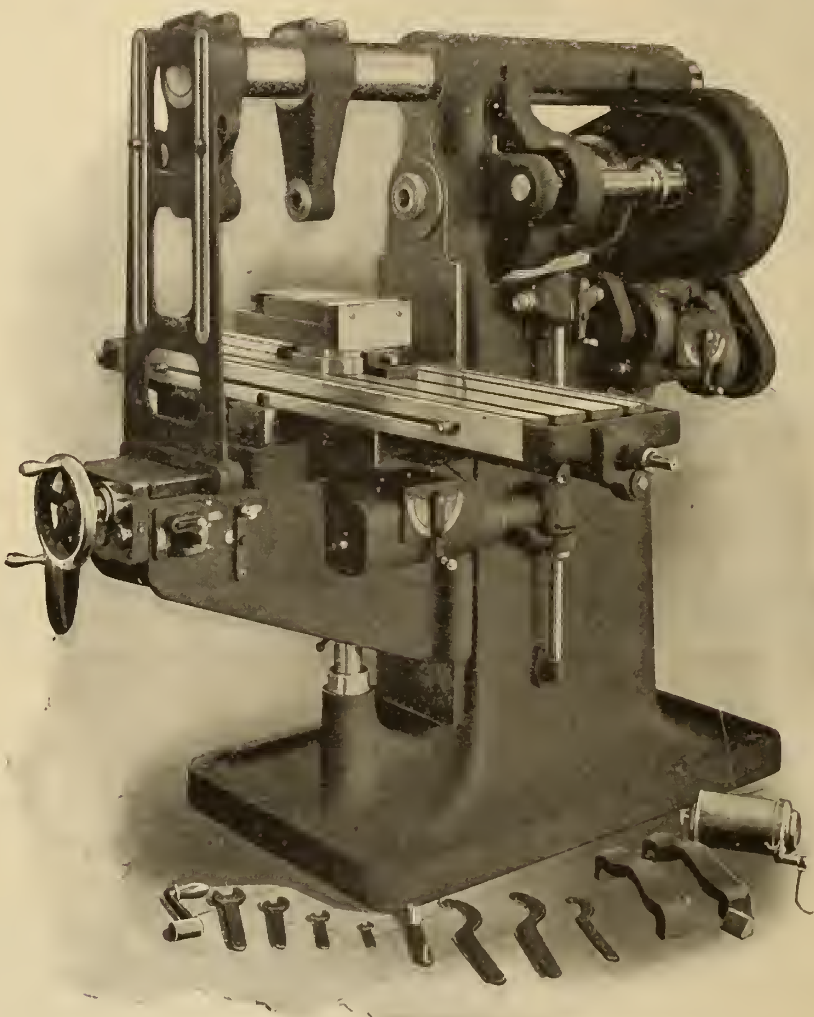

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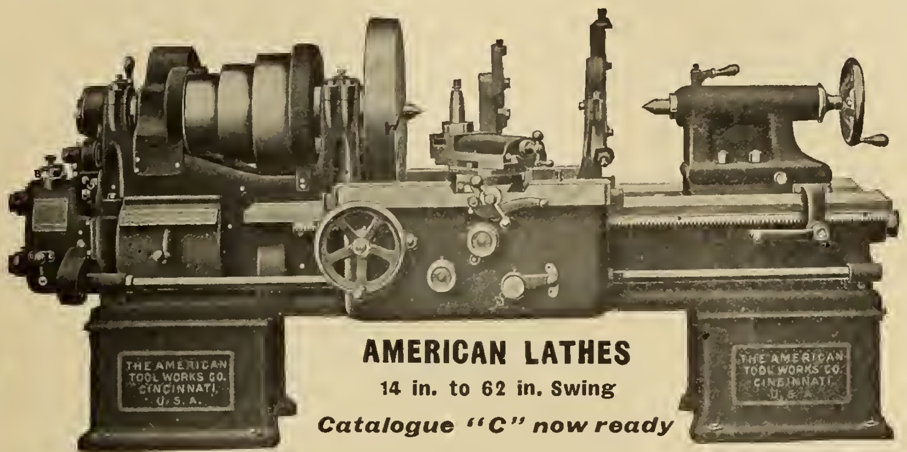

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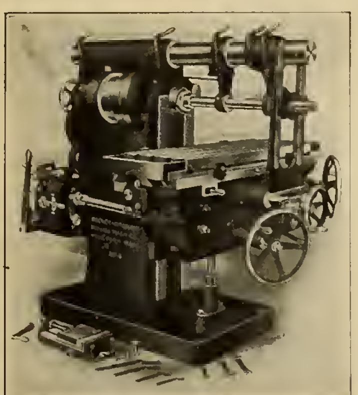

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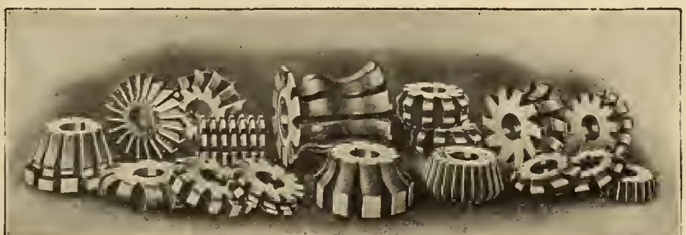

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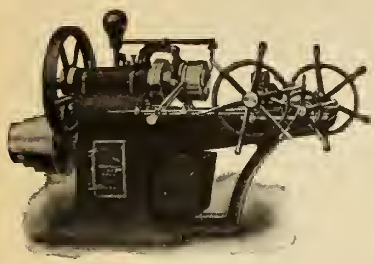

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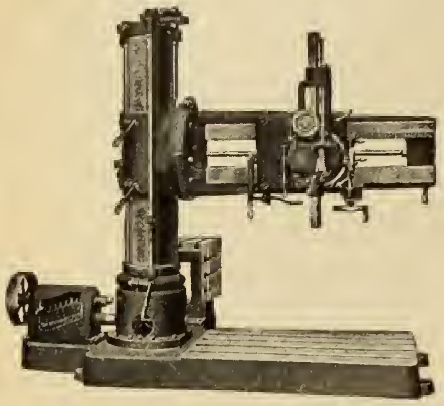

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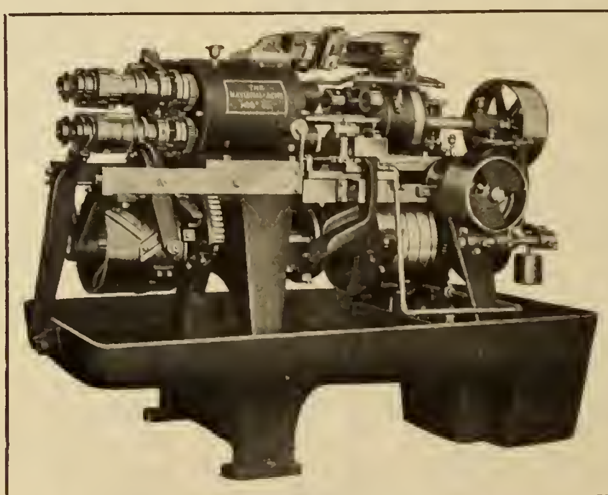

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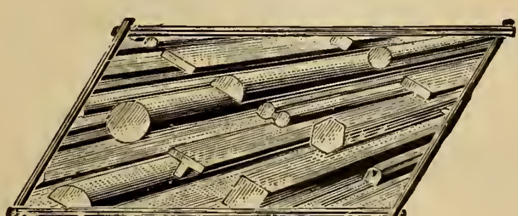

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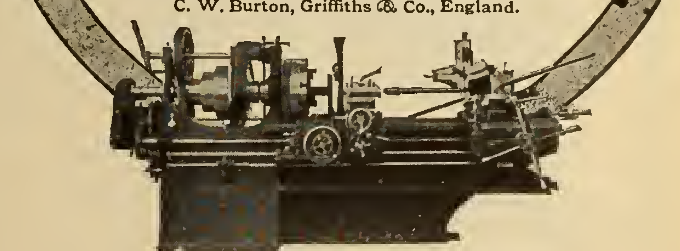

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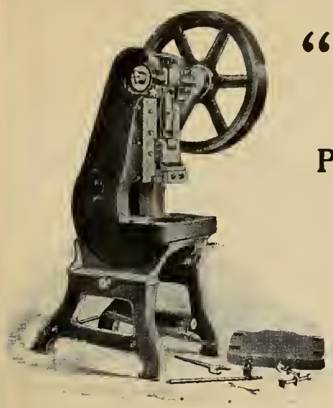

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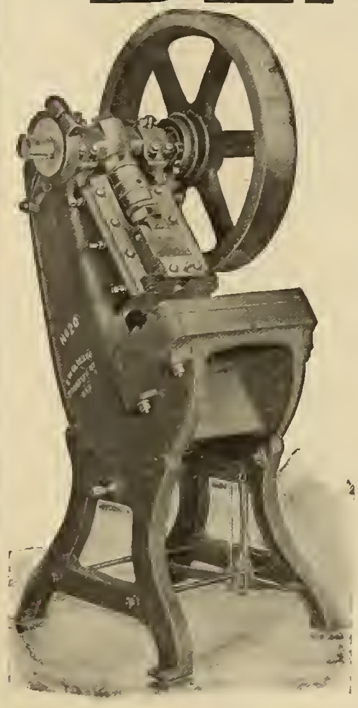

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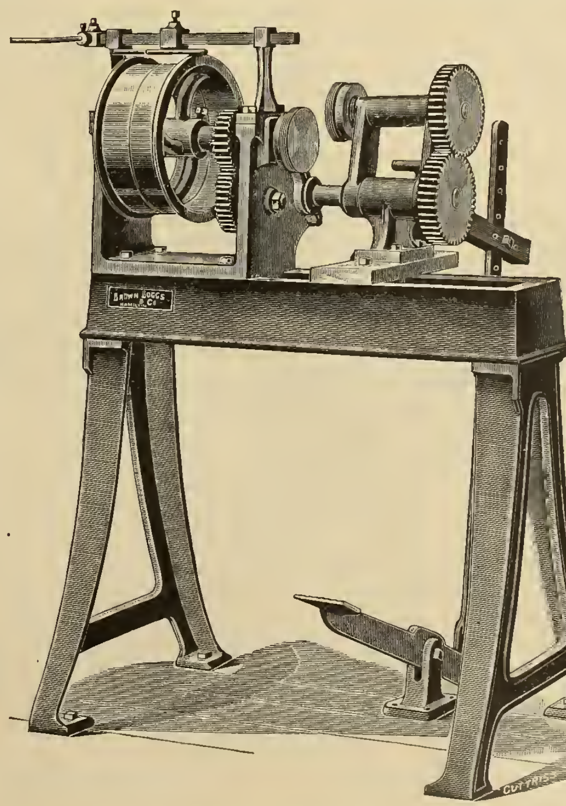

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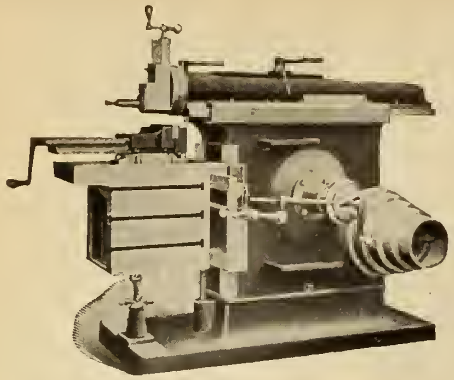

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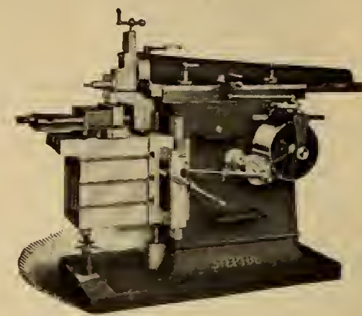

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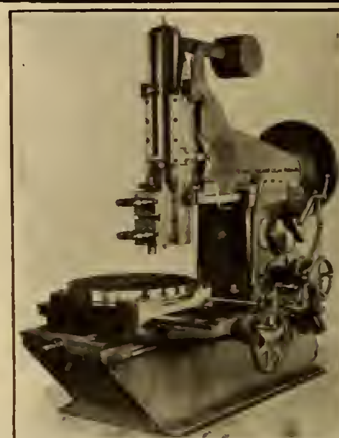

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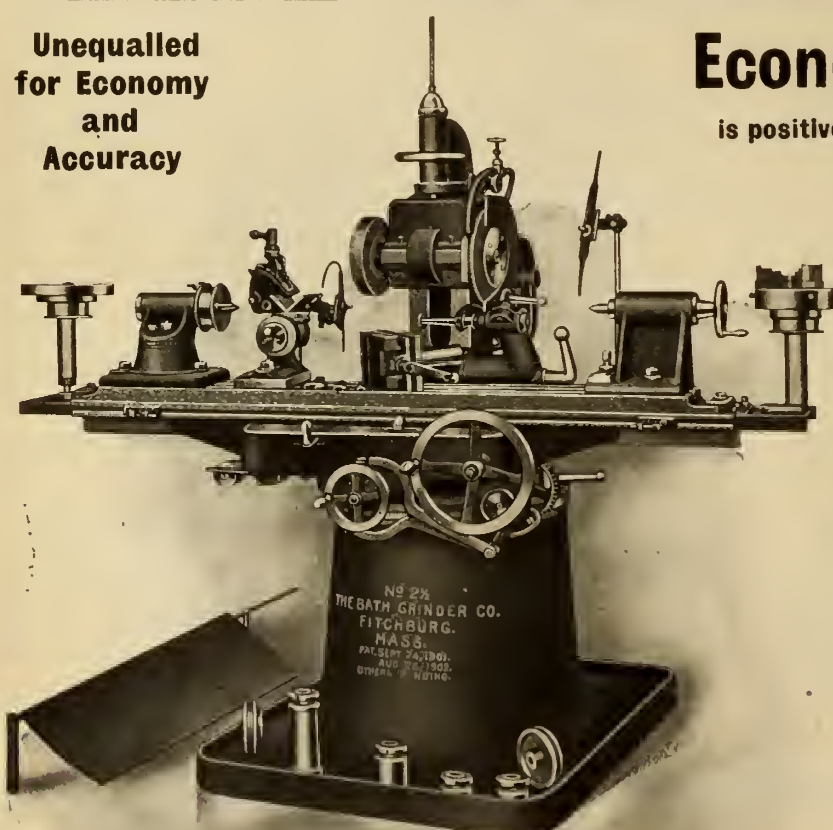

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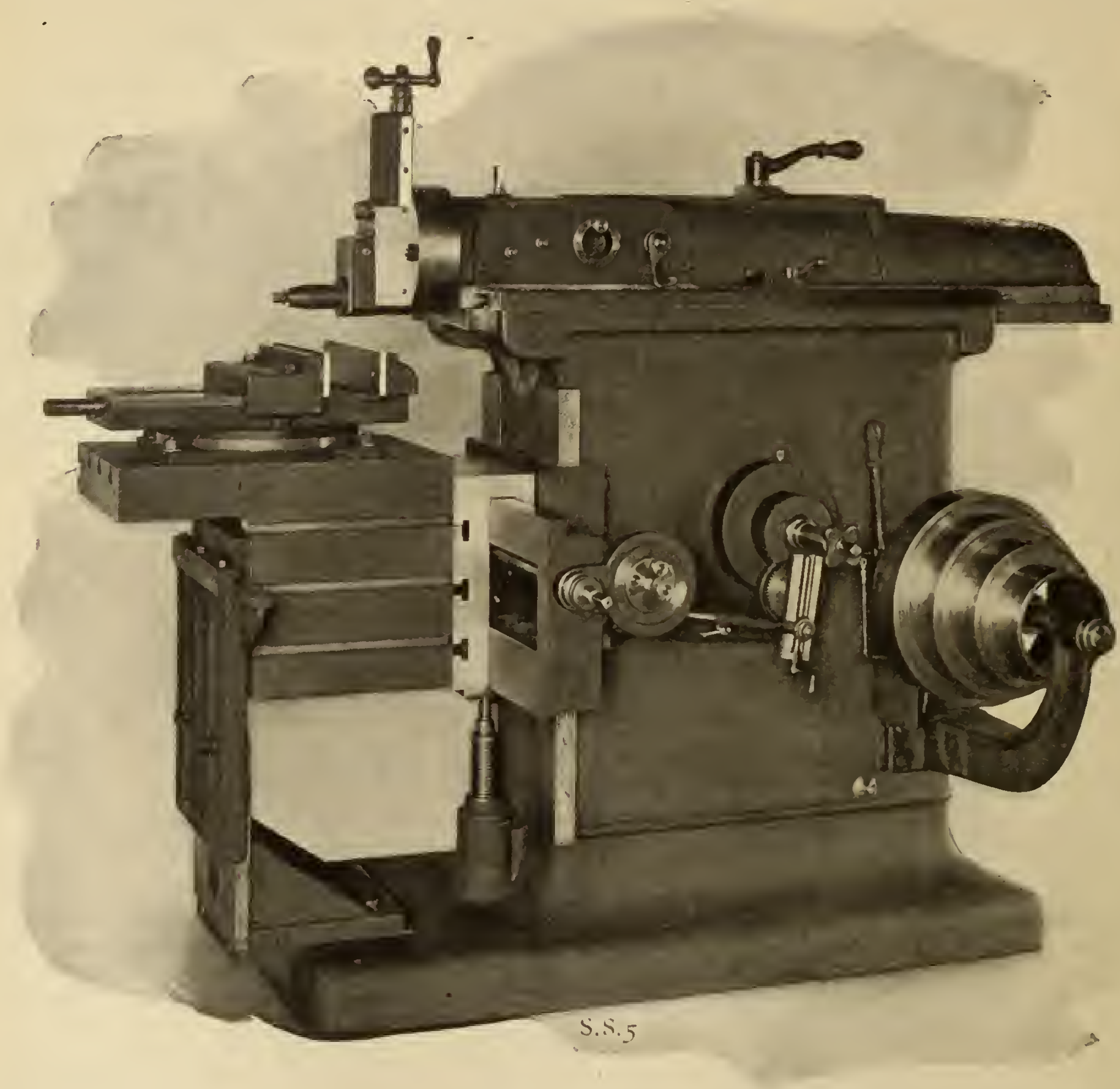

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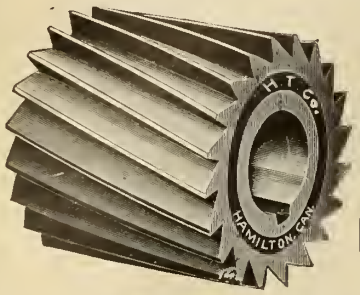

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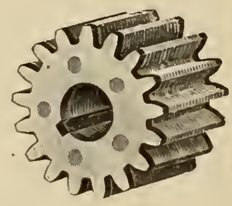

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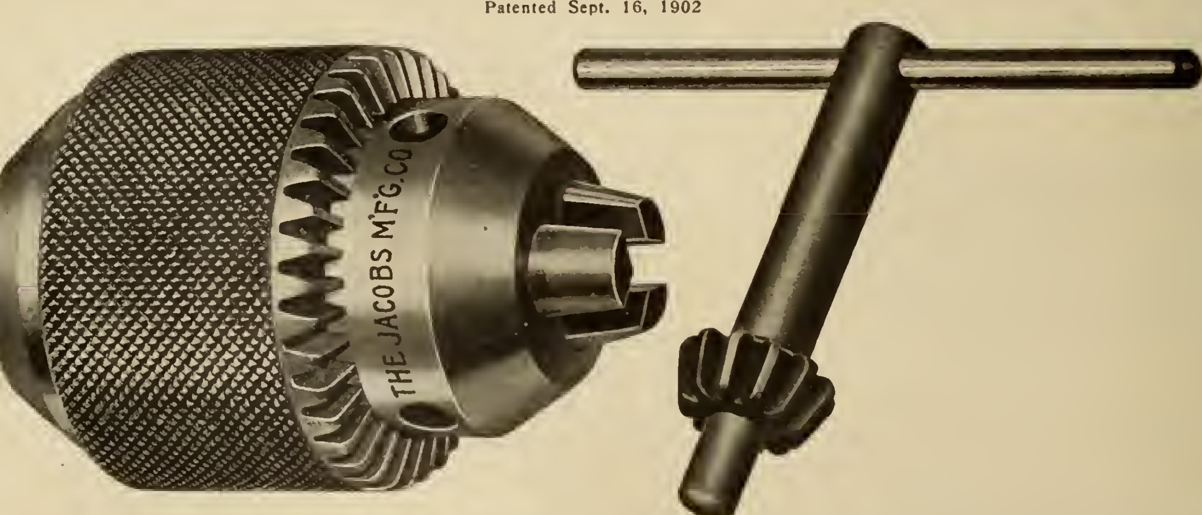

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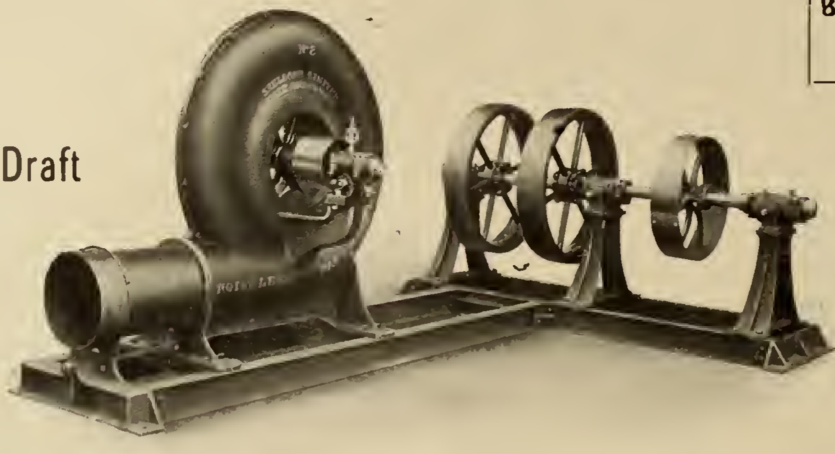

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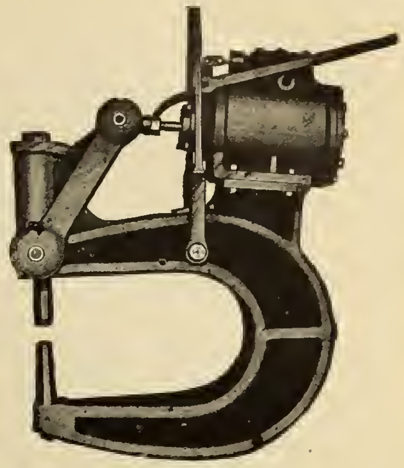

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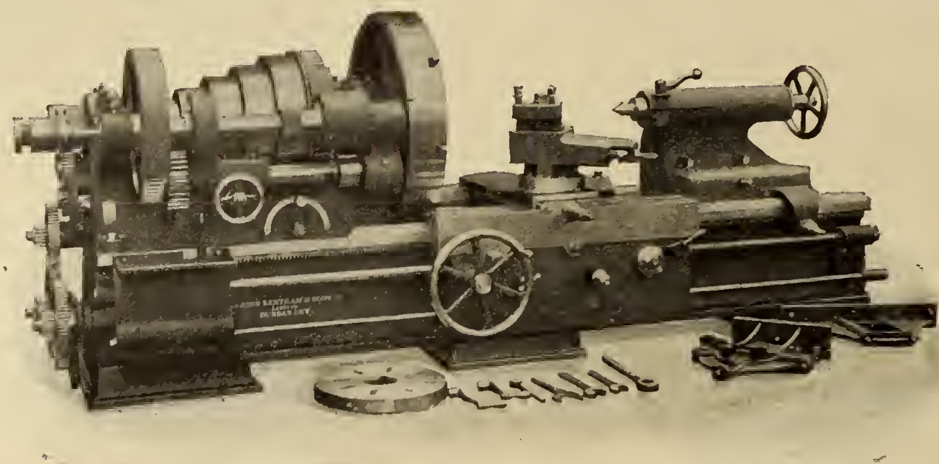

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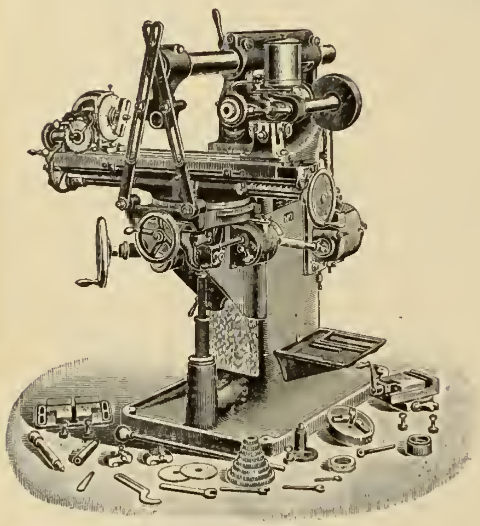

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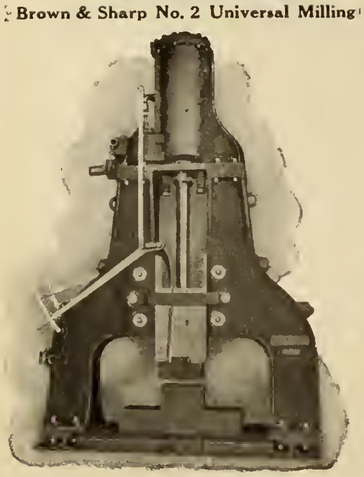

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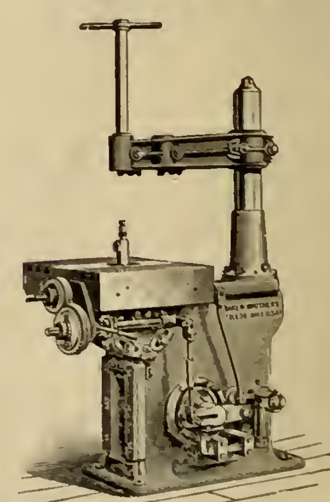

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The Royal Canadian Mint at Ottawa Now Coining Money

Description of the Machine Equipment and of the Various Processes Through Which our Money Passes, Before it is Placed in Current Use

Thé new sandstone and granite Royal Mint, surrounded by a fence of regulation height, is now in operation. All the machinery is the best that money can buy, and the accuracy of each machine is its strong point. The machinery is of the most modern type, and embraces many improvements which are not to be found in any other similar institution in the world. The ideas of A. H. W. Cleave, mechanical engineer and mint superintendent, have been incorporated in their design.

As the material is required it is weighed on scales which weigh accurately to one one-hundredth part of an ounce, mixed in proper proportions, and is placed in a crucible in one of the four Rockwell furnaces. These crucibles are made of clay and plumbago and hold ninety pounds. The furnaces burn crude oil with a steam blast, and the temperature can be regulated to melt nickle or aluminum. Fig. 1 is a view of the melting furnaces showing condensing chamber and acid and water tanks. Before melting, the metal is granulated by being heated and poured into tanks of water, which are situated under the iron plating at the left of the foreground. The condensing chamber baffles the gases, reduces their velocity, and the dust is deposited and the particles of gold and silver which have been carried from the crucibles are recovered. At the mint in Philadelphia no less than $12,000 was saved in this way last year.

A trolley above the furnaces facilitates the handling of the metal, which is poured into a set of molds. These molds are plunged into nitric acid and then into water. The molds are trimmed by shears and rotary files and each one is tested before operations are proceeded with. Fig. 2 shows the interior of the assay department and the furnaces where the tests are made. After the crucibles and their covers have been used about twenty times, they are ground up, and the precious metal adhering to them is recovered.

Fig. 1—Melting Furnaces ; Condenser Chamber ; Acid and Water Tanks.

The Rolling Process.

The bars, when approved by the analyst, are sent to the Taylor & Challen, Birmingham, England, rolling mill and passed through fifteen-ton rolls from eight to ten times. This rolling mill is a great improvement on some of the cumbersome machines now in use in some mints. The rolls are fourteen inches in diameter, sixteen inches long and run at forty revolutions per minute. This rolling mill is shown in Fig. 3. The greatest possible care was taken in the design and manufacture of this massive machine, and rolls to within five ten-thousandths of an inch. A thirty horse-power motor furnishes the power for the operation of this machine.

The rolling renders the metal brittle, and the bars are passed through an annealing furnace, shown on the right of Fig. 3. They are carried on three revolving chains and become red-hot. The fuel is crude oil, with steam at sixty pounds pressure. When the bars emerge from the furnace they pass under a sheet of water and do not oxidize. They are then passed through a thinning mill, shown in the foreground in Fig. 4. Adjustments on these rolls allow the machine to be adjusted so that the coins do not vary more than two ten-thousandths. The bars are then drawn through small rolls to an accuracy of one ten-thousandth of an inch. This machine is known as a fillet, and is shown in the foreground of Fig. 5. It is supplied by Greenwood & Bately, Leeds, England.

The coins are then ready to be blanked. A trial blank is made and if satisfactory this work is proceeded with. Fig. 6 affords a view of the three automatic blanking presses, each of which has a capacity of three hundred per

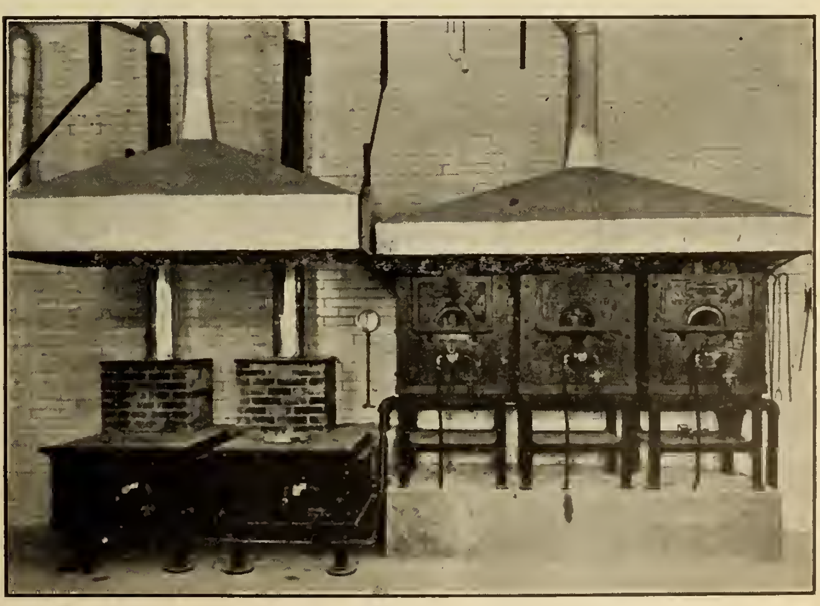


Fig. 2—Cupel and Melting Furnaces in Assay Department.

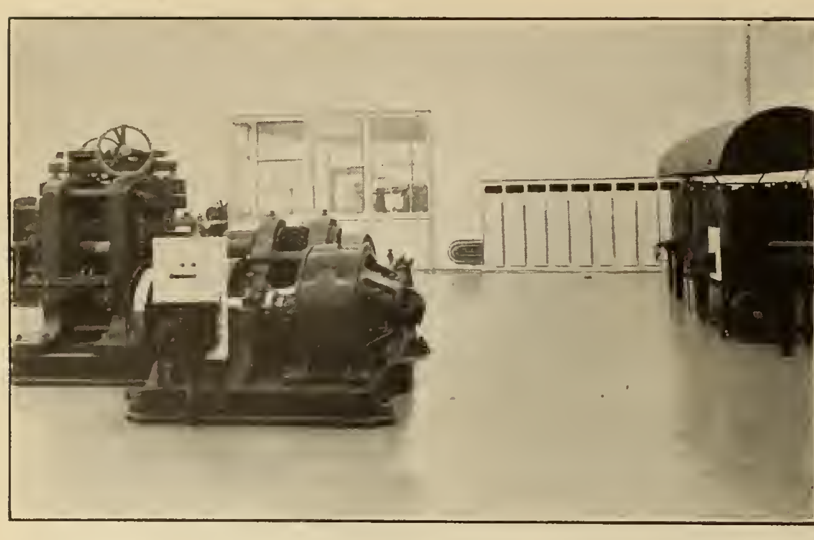


Fig. 3—Breaking-down Mill and Fillet Annealing Furnaces.

minute. The machine shown in Fig. 7 raises a ridge around the coin to protect the impression and has a capacity of six hundred per minute.

The punching hardens the metal, and it is passed through another Rockwell annealing furnace with oil as fuel. The coins are passed through the heat by means of a rotating screw and drop into water, so do not tarnish.

The next operation is to revolve them in a solution of sulphuric acid in a pyramid revolving mill and then passes them through hot and cold water baths. They are dried by rolling in sawdust in a rotating tumbling barrel for ten minutes, and are then separated by screens and the sawdust is dried and used again.

The Coining Room.

The finishing operating is in the coining room proper, where the impressions are made on the coins. There are three Taylor & Challen presses, shown in Fig. 8, running at from thirty to one hundred revolutions per minute, the speed being controlled by electric controllers. They can be run by gear or belt drive from their motors, and a five horse-power motor furnishes the power to each. In machines of this kind built previous to these, if the blanks ran out the dies would come together and be destroyed. The Canadian coining presses, to avoid accidents of this kind, have been fitted with non-clashing attachments, the invention of Superintendent Cleave, so that should the supply of blanks accidentally give out, the machines are automatically stopped. This press is the first of its kind ever used in a Government mint. The capacity is one hundred coins per minute.

After the impression has been given to the coins they go to the testing room, where every coin is separately weighed to one-hundredth part of a grain on automatic weighing machines. There are four and they are of a very delicate character, mounted on a solid bed of concrete ten feet thick to prevent vibration. Each machine will weigh twenty coins in a minute, and those of proper weight are dropped in one compartment, while the others are dropped into another to go through the process again. These are passed through the defacing machine shown on the right of Fig. 9, so that they cannot by any mistake become surrent coin. Before being weighed they are placed on the revolving belt shown in Fig. 9. This reverses the coin and an operator can see that both sides are perfect before they go to the weighing machines.

The good coins, when weighed, are dropped into bags ready for deposit in the vaults. A vault door may be seen in Fig. 7. The combination is a double, triple time. Two men, with separate

Fig. 5—General View of Rolling and Adjusting Room, Showing Draw-bench, Automatic Trying, Cutter and Scale Room.

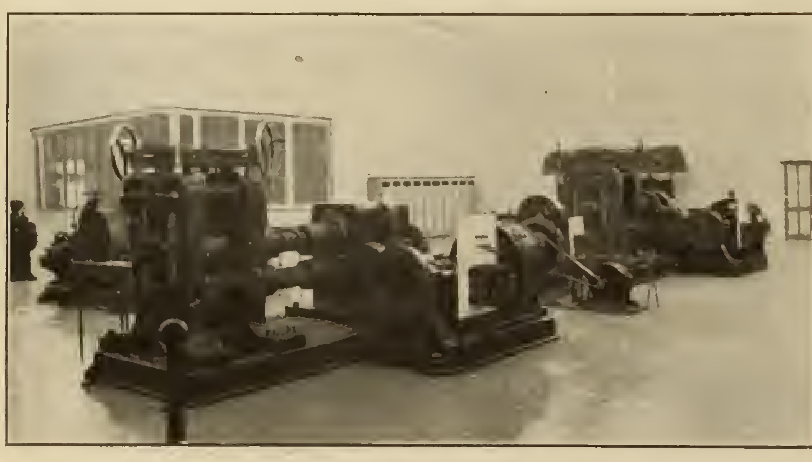


Fig. 1—Rolling Mills; Fillet Annealing Furnaces on Right.

combinations open the doors The doors, though they weigh 7,600 pounds, swing easily. A counting machine counts the coins into bags ; and this is unique, as in London the coins are counted by weighing.

The Power Plant.

Power is received from the Ottawa Electric Company at 2,140 volts, and is reduced through oil transformers to 500 volts. The current is reduced to 110 volts for lights, and by a two-phase Canadian Westinghouse motor-generator set is changed to 220 volt, direct, for the motors. All the machinery, except in the machine shop, is driven by individual motor drive.

The steam used in the annealing and die-hardening furnaces, as well as that for heating the buildings, is generated by two Leonard multi-tubular boilers. These are shown in Fig. 10. Water is fed automatically by a Fairbanks-Morse pump. An injector and feed from city mains are also attached, forming three independent sources of boiler feed.

Fig. 7—Marking Machine and Stronghold Door.

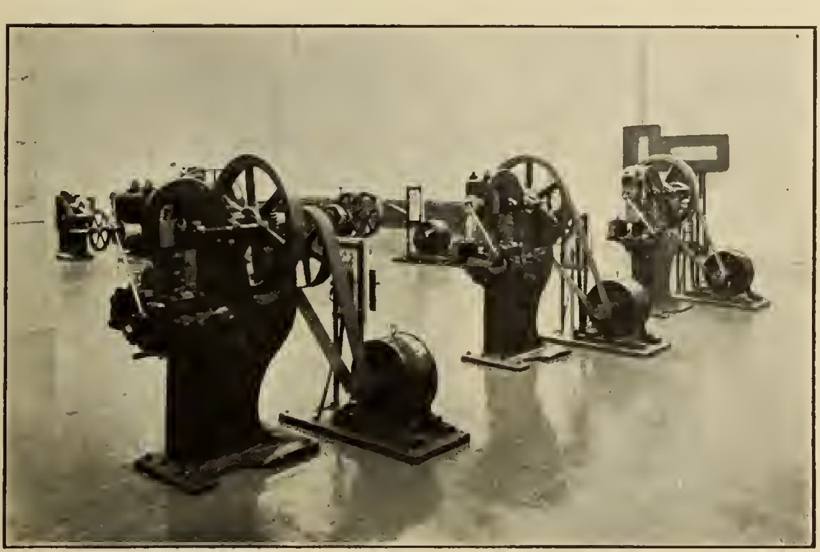


Fig. 6—Machines in Cutting, Adjusting and Marking Department.

The Machine Department.

Adjacent to the boilers in the basement is the smithy, where is located a one-hundred-pound Fairbanks hammer, a Buffalo forge and a Bersch shears, all shown in Fig. 12.

A forty-ton Taylor & Challen friction reversing die-sinking press, shown in Fig. 11, is used for making the dies. Each die is given three blows and after each blow it is annealed in an oil furnace. The die room is in an apartment alone. This press reverses automatically and is the only one yet installed where the operator does not have to watch the return motion. A light or heavy blow, as desired, may be struck with this friction screw press. Adjustments can be very accurately made and provision is made by means of collars for the wear of the screw.

In another department is the machine shop. This includes a Norton wet grinder, which is shown in the foreground in Fig. 12. This machine grinds accurately the rolls for the rolling mills and will grind a roll seventy-two inches long and fourteen inches in diameter. It is built especially for the work in the mint, as are all the machines in the various departments. The equipment also includes a No. 13 Brown & Sharpe universal grinder, a No. 2 miller with a dividing heel, a Bertram five horse-power planer, an automatic hack saw, Barnes 21-inch drill, a Hamilton Tool & Optical Co. sensitive drill, McDougall heavy 16-inch gap-lathe, Pratt & Whitney 14-inch light lathe, and an R. A. Kelly shaper.

In each department special precautions are taken. The locks are of a special character, and the walls are two feet

Fig. 8—The Coining Presses.

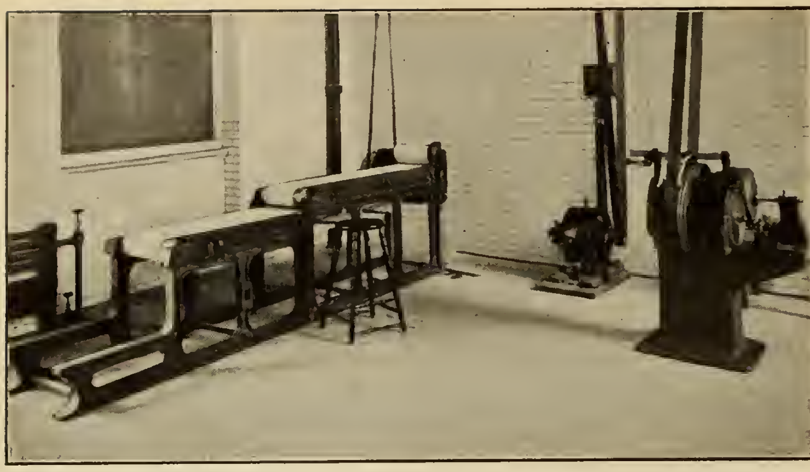


Fig. 9—Overlooking and Defacing Machines in Weighing and Examining Room.

thick, reinforced with layers of steel, and even dynamite will not be able to disturb them.

Those in charge are Dr. D. Bonar, deputy-master ; Mr. A. H. W. Cleave, M.I.M.E., superintendent ; Mr. P. S. Roe, foreman of mechanical department, who installed the machinery ; Mr. T. Mansell, foreman coining department, who has had twenty-seven years' experience in the Royal Mint, London ; Mr. D. P. Bateman, foreman of melting department, who has had twenty years' experience in this line of work.

AN INDUSTRIAL INCUBATOR.

By R. S. Smith.

A proposition that we are endeavoring to carry out in Elmira, N.Y., has, I believe, great possibilities in bearing on the future industrial development of cities. I refer to what we know as an "Industrial Incubator." This plan consists of the erection by a stock company of a building equipped for manufacturing purposes, power, light and heat furnished from one station for the entire building. In this incubator, infantile industries, patents and the like can be tried out and small enterprises given a chance to prove their possible earning capacity. I believe that such a plant would in addition to being a tremendous advantage to the city, make a profitable investment for the stockholders. Manufacturing space for small projects could be rented at a reasonable figure and if they thrive local investors could watch the development. As the infantile industries show themselves possessed of the stability for mature development, capital could be readily secured for the removal of the husky infant from the incubator to a substantial home of its own, and in this way many a good industry would be secured for the city.

DEVELOPING GRINDING PROCESS.

Wonderful strides are being made in grinding at the present time. Very considerable saving in time can be affected by the legitimate use of the grinding machine. Goldie & McCulloch, Galt, are just now developing this feature in the machining of engine cranks. They have installed a heavy roughing lathe, and are doing the finishing on a large grinder.

Fig. 11—Die Sinking Press in Die Department.

Fig. 10—Boiler House and Smith's Shop.

THE OVER-ALL DIMENSION.

The draftsman made a blunder,
But it wasn't very bad,
He simply failed to figure right
The thickness of a pad.

But when he finds his error,
And the patternmaker calls,
He makes him take his pads off
And change his "over-alls."

—McReel.

If you have no business of your own, make it your business to keep your nose out of other people's business.

Apprenticeship System of the Grand Trunk Railway

Showing how the Grand Trunk are Producing Skilled Machinists and Blacksmiths by their Shop Training and Night Classes for Apprentices

During the last one or two years Canadian manufacturers have been considering very closely the question of technical education. Educationalists have also been discussing the question to some result. Interest in the question has been aroused by a very natural cause, the increasing demand for skilled mechanics and the difficulty experienced by manufacturers in getting them. In the olden days there was the apprenticeship system, where a manufacturer was paid to teach apprentices a trade. Modern methods of manufacture and changed conditions have altogether done away with this system, and the trouble is that very little has been done in Canada to provide some system of training to take its place. In some of the older countries technical education schemes have developed gradually, and at present technical education is on a good footing in such countries as Great Britain, Germany, France and the United States, although in the latter country there is much still to be done.

There are many different phases to the technical education question, including trade schools, with day and night classes, technical high schools, with day and night classes, to a degree, university science courses, and the modern apprenticeship courses.

It seems to be generally held by men who are intimately connected with the question that it is the Dominion Government to whom we should look to take up this question thoroughly, and to assume the necessary expense of the work. This was the idea which was paramount at a recent meeting of the Canadian Manufacturers' Association to discuss the question, which meeting was addressed by the Lieutenant-Governor of Ontario, and Dr. Packenham, Dean of the Faculty of Education. At the present session of the Ontario Parliament, a bill will be introduced by the Minister of Education, approving of this policy, and asking the Dominion Government to take up the question.

But there is more being done along modern apprenticeship lines than probably the majority of manufacturers realize ; and among large manufacturers and railway companies there are possibilities of organizing apprenticeship systems, which would be paying investments for themselves and of great general value to technical education. At present several of the railways have apprenticeship systems which are doing excellent work. There are also other companies in the United States which have excellent apprenticeship courses, including such firms as Baldwin Locomotive Works, Brown & Sharpe, Westinghouse Co., and others.

For the information of Canadian manufacturers and others interested, Canadian Machinery will publish data on these different systems, beginning with that employed by the Grand Trunk Railway. Others will appear in future issues.

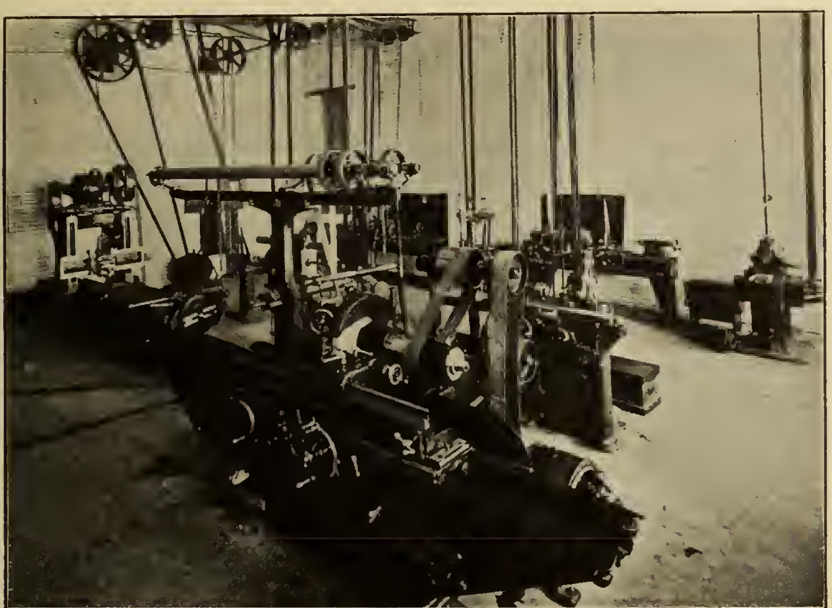


Fig. 12—Machine Shop, Showing Grinder in Foreground.

Throughout their whole system the G.T.R. have an apprenticeship system which gives good satisfaction. The feature of the system, as far as technical education is concerned, is the night classes held by the company to teach drawing and practical mechanics to the apprentices. An agreement is entered into by the company, the boy's parents or guardian, and the boy himself, the main features of the agreement being : The boy agrees to serve the company for a term of five years, the wages for each year being stipulated, and the company agree to give the boy suitable instruction in the trade ; the company retains out of the wages the sum of five cents per working day, as a guarantee of good behavior, this amount to be repaid to the apprentice upon the satisfactory completion of the apprenticeship course, but in case the boy leaves, or is discharged for a good cause this money is forfeited ; the boy agrees to attend such evening classes for instruction in mechanical drawing and mathematics as the company prescribes; at the end of the apprenticeship the company gives a voluntary bonus of twenty-five dollars, if the course has been satisfactorily completed.

In addition to this the company have an accident and sick benefit society, of which all apprentices and other employes must be members, the monthly dues being deducted from their pay.

It is with the conduct of the evening classes that we are chiefly interested. James Powell, chief draughtsman, Montreal, has charge of this instruction. At each shop, namely, Montreal, Toronto, Stratford, Fort Gratiot and Deering, (Portland), night classes are held twice a week during the fall and winter months. These classes are conducted by one or more instructors, who follow more or less closely a plan arranged by Mr. Powell. At the end of each year examinations are held, the papers being prepared by Mr. Powell. Prizes are given each year to the individual obtaining the highest marks in each subject in each apprenticeship year at the several stations, and a special prize to the apprentice obtaining the highest number of marks on the entire system, as well as a prize to the station obtaining the highest aggregate marks. This prize-giving is a good feature as it tends to waken competition and arouse interest, thus making it easier to get a good attendance at the classes and good work while the boys are there.

A small book, "Practical Mechanics," has been written by Mr. Powell for use in the classes, containing questions and answers in arithmetic and practical mechanics. These questions are of a very practical nature, examples of which the apprentice can see every day in the

shops. The book also contains a short history of the locomotive.

The instruction in mechanical drawing is given chiefly with the idea of teaching the apprentices how to read drawings and how to make a sketch of parts they might have to make.

An objectionable feature of these classes is their being held at night, necessitating the apprentices going home and then coming back again two nights in the week. It's a little too much to expect of a boy to do faithful work for ten hours in the shop during the day, and two hours more at night twice a week.

At the end of the apprenticeship course, the company give a diploma worded thus:

This certifies that .... has well and truly served as an apprentice of this company from.................. to .... in learning the trade of ...., and that during his apprenticeship he received the requisite practical training and instruction necessary to qualify him to practice the said trade.

(Signed), ...,
Master Mechanic.

Approved ....,
Supt. of Motive Power.
.... Shops.

In a railway shop it is easier to arrange for apprentices getting a general knowledge of all the machinery and operations, than in many strictly manufacturing shops, and the Grand Trunk do give their apprentices a good general training.

It is only after the first one or two years that the apprentices begin to pay for themselves, and probably during the last one or two years the apprentices are really making a good deal more than they are paid for, but this must be in order to make up for the first year. Then, too, what the company lose by some apprentices leaving after the first year, (for there is nothing practical to prevent them doing so) must be made up on the others.

The classes are conducted in the majority of cases by someone working in the shops, and in this way the instruction is of a class that will be directly applicable to everyday work and experiences.

Quite an interesting feature of the G. T. R. apprenticeship course, is the scholarship at McGill University, open to apprentices and sons of employes. An annual competitive examination is held for the awarding of this scholarship.

W. D. Robb has taken a great interest in the apprenticeship system, and has devoted quite a little time to formulating this plan for the improvement of apprentices.

The Combination Disc Grinder : Example of Work

English Practice Criticized — Combination Grinder, at which Two Operators Can Work—Time Occupied in Grinding Certain Pieces.

By F. N. GARDNER. *

My attention has recently been called to a number of catalogues on disc grinders made in Europe—particularly in England—and I was somewhat surprised at the line of development which seems to have been followed on "the other side." The small and medium size machines shown in these catalogues would indicate that they have made very little change in the machines, which were originally copied from ours about ten years ago, but they have certainly carried sizes beyond what I expected, or am inclined to approve. As an example, two concerns at least in England advertised disc grinders with disc wheels 40 inches in diameter by 1 inch thick. Such wheels would weigh 360 lbs. each. The builders recommend a speed of 800 revolutions per minute, which would give about 8,500 feet per minute periphery speed. They also recommended No. 24 emery paper. Figuring from size of pulley and speed, the amount of power applied to these 40-in. diameter wheels is less than 20 h.p.

Referring to my statement in the February issue of Canadian Machinery that 15 to 20 h.p. can be used to good advantage on disc wheels 20-in. diameter —and the truth of this statement I have demonstrated many times—I fail to see the consistency of using wheels 40-in. diameter, and backing them up with only 20 h.p. Not being personally familiar with the use of these very large English machines, I assume that they are chiefly useful for finishing or polishing surfaces that have been machined and partially finished by some other method. For the work required of disc grinders in this country, I would not advise using 40-in. diameter wheels unless they were provided with at least 40 h.p.

Of late years I have had very little inclination to build simply "bigger polishing machines," but have aimed—and I think it is the aim of all the leading American builders—particularly toward increasing the efficiency of these machines on operations when the material is taken in the rough and finished, thus in a very large variety of work doing away with the necessity of milling, shaping, etc. I do not wish to be understood as claiming that disc grinders do away with the necessity of such machines, but it is an unquestionable fact that a vast amount of work is still being done with the machines mentioned that can be done with disc grinders at small fraction of present cost.

Example of Work.

I have lately finished a test on grinding cast iron. During this test more than one-half a cubic inch of iron was ground off per minute for 10 hours—making total of 300 cubic inches. The pieces ground had surface area of about 5 square inches, and thickness of metal removed would average 1-32-in., making 5-32 of one cubic inch from each piece. Thus about 2,000 pieces were finished

*President and General Manager, Gardner Machine Co., Beloit, Wis.

on one side in ten hours, and the finish was better, or at least just as flat and considerably smoother than could have been got with a milling machine or shaper. Again, don't think that I am "knocking" milling machines. We use them in building disc grinders. There are a great many more varieties and kinds of work that can be done with a milling machine and cannot be done with a disc grinder, than the reverse. However, on kinds of work that are adapted to a disc grinder—and their name is legion— the other machines mentioned are simply not in it.

Last month I spoke of the double head disc grinder. The accompanying cut shows work being done on what is perhaps the latest development in that line, viz., a "combination disc grinder. It has the regular double head features as described last month, and also a single wheel with lever table similar to that shown last month mounted on a rockershaft extended from left-hand end of the base. This really gives two types of disc grinder combined on one base and allows the employment of two operators, as shown in accompanying halftone—or a single operator can make such cuts as can be made with the double wheels, and can then finish on the single wheel other portions of the work. The advantages of this type of machine are obvious. The disadvantages are less obvious, although they do exist. I am not generally an advocate of "combination" machines, but am rather favorably inclined towards combination disc grinders, and have recommended them in many cases—particularly when saving of shop room and also in first cost is an important point.

The accompanying illustration shows a combination disc grinder being operated on screw wrenches. I think no amount of description can make the operation more clear to the reader, so will confine myself to report of results obtained on this particular job.

The wrenches shown in picture were drop forgings. They were first rough ground with No. 16 abrasive, between the two wheels. This rough grinding was done at the rate of about three wrenches per minute. The finishing was done in same way with No. 46 abrasive at rate of about six wrenches per minute. A portion of the samples had been roughed to size by straddle milling. Those that had been milled took more time to grind than did the rough forgings. This was because the milling cutters had made some rather deep scratches in the metal. I am informed that the time regularly taken for straddle milling these wrenches wa about two minutes each. I have no information regarding the time formerly taken to finish on a buffing wheel after they came from the milling machine, but think it could not have been less than two minutes each. This would make about four minutes for the same work that the record shows can be done with a double head disc grinder in about half a minute. I have no reason to doubt the accuracy of this report and will say that the comparison shown in it between milling machine output and disc grinder output is by no means unusual.

Referring again to our friends over the water. I have no information that they have given any attention to double head machines, If they have—or when they do—I shall be much interested to learn how closely they have followed our lead.

Roller Bearings: Design, Construction and Use

Paying Particular Attention to the Straight Roller Bearing, and Illustrating with Bearings used in Agricultural Machinery and Trucks

By A. E. D., Smith's Falls

Roller bearings are now used extensively, and have in many places replaced ordinary brass and babbit bearings. They are now used with great success in electric car journals, agricultural machinery, vehicles, rotary engines, trolleys for foundries and factories, etc., and are found to give good satisfaction. There are several types of roller bearings, taper and straight, all of which came from the old method of using a piece of wood or iron to move weights over the ground. This ancient method is still used; and on it was founded the present roller bearings.

Roller bearings are better load supporters than ball bearings, for where ball bearings have at the utmost four points of contact, roller bearings make contacts along two straight lines the whole length of the roller.* Great progress has been made in the application of both roller and ball bearings in the past five or six years. For journals that have to carry heavy loads such as those for electric cars, roller bearings have been used with great success.

A straight roller bearing is cylindrical and the same diameter throughout its length. These are enclosed in a roller cage, as shown in Fig. 3, that keeps the axis of each roller always parallel with the shaft. In the taper bearing, each roller is conical and these roll in conical sleeves. All these surfaces form right cones of revolution. The vertices of these cones are in the axis of the

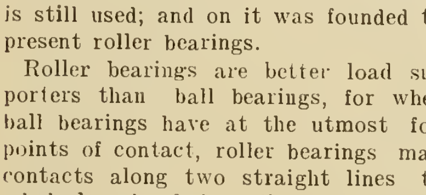


Fig. 3.—Roller Bearing Complete.

shaft, and the axis of the rolling taper bearing describes a cone with vertex also in the centre of the shaft. In practice a cage is used for the taper bearings to preserve their alignment. Mathematically considered, the roller bearing is a development of the taper bearing, with a common vertex of the three conical surfaces, outer and inner raceways and the roller surface, at an infinite distance.

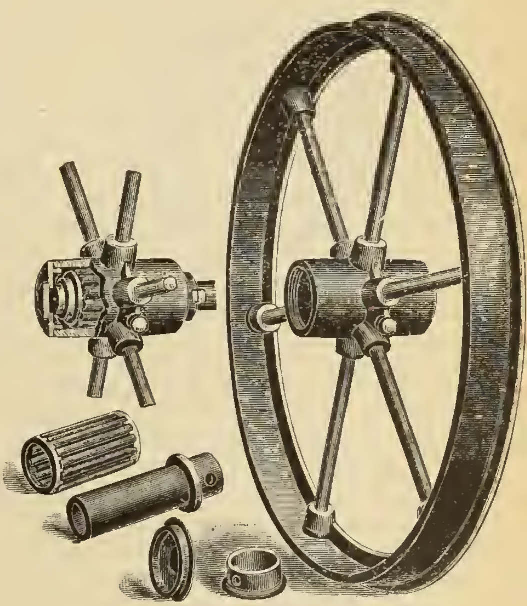


Fig. 2—A Dust-proof Roller Bearing.

The straight roller bearing carries the load only, while a taper bearing is subject to an end thrust. Roller bearings of the straight type are shown in Figs. 1 and 2. These are two types of straight roller bearings as used in the agricultural machinery of the Frost & Wood Co., Smith's Falls, Ont. These bearings are also used on the several hundred shop trucks, and on all the overhead trolleys throughout the fac-

* This is a statement over which there has been considerable discussion; it has always been the specific advantage quoted by roller bearing manufacturers for roller bearings, and roller bearings are used for very heavy work; but ball bearings have also been used with great success for heavy work, particularly the double ball bearing. It is doubtful whether this feature of roller bearings is of as great importance as sometimes made out.—Editor.

tory. By using the roller bearings, trucks, loaded to their full capacity with pig iron or any material, can be handled by one man.

In these rollers, as will be seen in Figs. 2 and 4, the rollers are separated by the malleable iron collars of the cage. The construction of the cage is such that the roller bearings have a bearing surface the whole length of the roller. In some cases a small intermediate roller is inserted, but the former method of construction is much cheaper, and is very satisfactory. This latter method of separating the rollers, keeps them in alignment, and is a great advantage over the bearing where the pressure-bearing rollers are in contact.

The Making of Roller Bearings.

The roller bearings illustrated in this article consists of two malleable rings connected by three tie-pins and a number of rollers depending on the size of

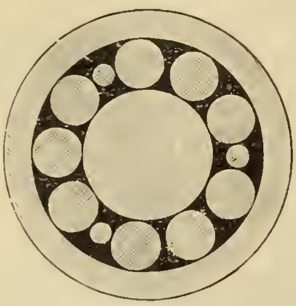


Fig. 4—Cross-section of Roller Bearing.

shaft and the load for which they are designed. The manufacture of roller bearings consists of several interesting operations. The rollers are cut to length and ground, a gauge being used to cut them to their proper length.

The tie-pins for the cage are cut to length and are about 11-64-ins. in diameter. These are milled on the ends to ped and drifted to straighten them, and make them standard size. Thus there is no possibility of friction between the ring and the shaft. The rollers project just far enough to prevent the ring touching either shaft or housing.

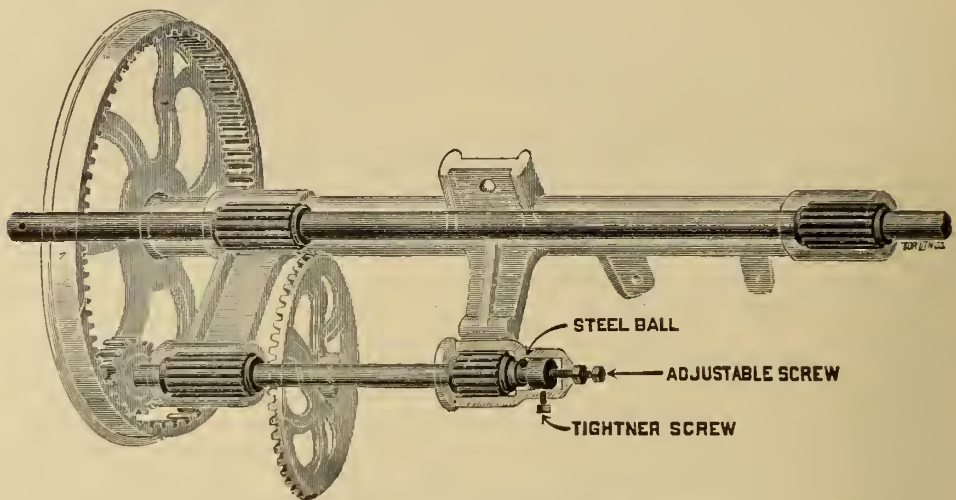


Fig. 1—Roller Bearings as Used in Agricultural Machiner

One ring is riveted with three pins, and the rollers are inserted and the second ring is riveted on. As the tie-pins are standard, the roller bearings, when completed, are standard.

Rollers must be provided with sufficient bearing in lineal inches and be of sufficient diameter to withstand the stresses imposed upon them. They must be as simple as possible and made of suitable material. The average bearing should be from two to four times the diameter of the shaft in length. By having the bearing long the life of the shafting is ensured, as well as the life of the bearing. The length must be sufficient so that the rollers will withstand, without damage, the pressure they must bear and they must be so constructed as to exclude dirt or grit.

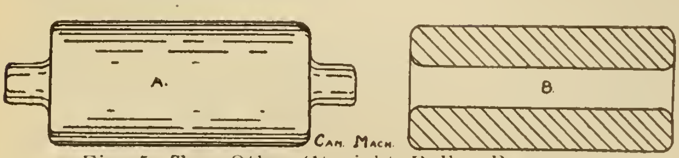


Fig. 5—Two Other Straight Roller Bearings.

Fig. 6—Two types of Taper Bearings.

9-64 ins., thus forming a shoulder against which the malleable rings rest and as the pins are milled to a gauge the bearings are standard size. The milling of these tie-pins is done on special machines built for that purpose, and is accomplished very quickly and accurately at an exceedingly low cost.

The malleable rings are designed, as mentioned above, to perform the double duty of separating the rollers and keeping them in alignment, When the malleable rings come from the annealing furnace, they are more or less out of shape, and before being drilled with a 9-16-inch drill for the tie-pins, they are drop-

Fig. 2 shows a plow bearing covered so that no dirt can enter the bearing.

In Fig. 5 are two other types of straight roller bearings in practical use. The roller A is self-contained, while B rolls on a separate axis. In Fig. 6 are two types of taper bearings, A and B corresponding to A and B in Fig. 5. The size of the bearings of A in Figs. 5 and 6 depends on the load which they must carry.

(There is a feature in the manufacture of roller bearings which the writer o this article has mentioned, but which has not been sufficiently emphasized. This is the perfect grinding of the rollers. It is very important that the diameter of the roller be perfectly uniform from end to end of the roller. There is the same necessity for absolute accuracy for the balls in ball bearings.—Editor.)

FOUR ESSENTIALS OF GOOD SALES LETTER.

There are really only four points to be observed in writing a good sales letter, and they are: Description, Explanation, Argument and Persuasion.

First describe the article which you are endeavoring to sell, that is, a technical description; then give an explanation of its different features and advantage over similar articles; then bring in your argument. You can then, for convenience, quote price and name delivery, and mention any other points which may come up in this connection. Last, but not least, bring to bear such persuasion as to get the customer to give you his order. Never end a letter without making some sort of an inducement to the customer to place his order at once.

It is necessary that your salesman use the same tactics. Impress upon them that much depends on the way they handle their prospects.—Selling Magazine.

In the cylinders of a compressed-air locomotive, only a low cold-test oil should be used. The oil should show a gravity of about 29, and a cold test of —5 deg. Fahrenheit.

A Combination Boring Bar for Boring, Reaming and Facing

Bar to Perform These Operations on Special Milling Machine Column, The Limited Number Necessitating a Special Jig at Small Cost

By JOHN EDGAR

Occasionally we strike a job in the general run of machine shop work that presents some points of interest ; and it is these that make such work worth doing. The work encountered may not be of a very complex nature in many cases

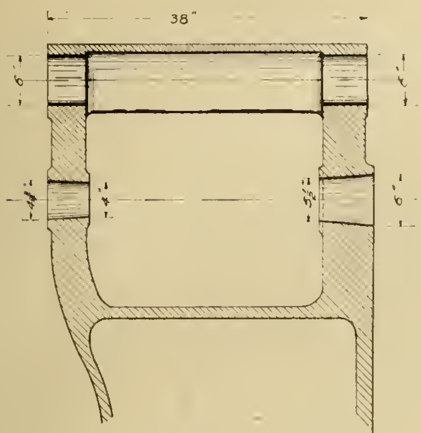


Fig. 1.

in order to make some serious thought necessary. This is especially so when we run across a job that is somewhat out of the sphere for which the shop may be equipped. It is this point that makes job shop work so instructive.

The Work for Which the Bar Was Designed.

The work on which the bar, that this article is to describe, was used, is of a special nature. While it was in the same general line as that ordinarily handled in the shop in which it was done, the general run of work was established on a manufacturing basis, and each job had special tools best fitted for them.

But this job, being special and of a nature that did not guarantee the expenditure of a large sum of money on tools, called for some figuring on our part to enable us to handle it successfully. The work being in the machine tool line—a milling machine column—made it necessary to come well within certain perscribed limits of accuracy. The casting operated upon weighed about 4,800 lbs., and was in no way easily handled, even under the traveler.

The boring operations were to be carried out on a large floor-boring drilling machine, which was located on the main floor, where the traveling crane was available.

To hold the work a special angle iron was made to receive the casting, so that the holes to be bored would be parallel with the spindle of the boring machine in the horizontal plane. Some little care was necessary in regard to this point, since the accuracy of alignment of the holes was to depend wholly on the alignment of the bar, no supporting bearing for it being provided other than that in the tail support of the machine.

Fig. 1 shows a section through the work showing the four holes that were bored by means of the bar. This figure gives some idea of the size of the casting and of the holes; two of which are tapered to receive the adjustable bearing bushing for the spindle. It is necessary that these two sets of holes should be on axis that are parallel in the verticle plane to within a very close degree of accuracy, as otherwise the adjustment of the arbor supports along the overhanging arm, which is supported by the upper set of holes, would bind the arbor and throw it out of alignment. The boring operation on the smaller standard machines is all done in accurately made jigs, in which the boring bars are well supported and alignment is thus easily obtained.

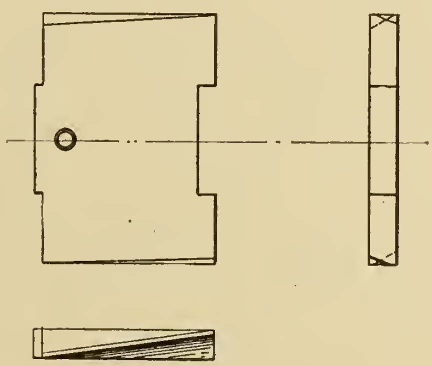


Fig. 3.

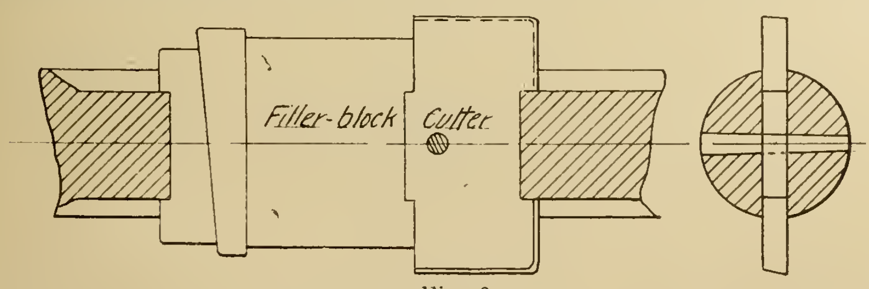


Fig. 2.

Manner of Performing Operations.

On this lot of a dozen castings we were to depend on the skill of the work-

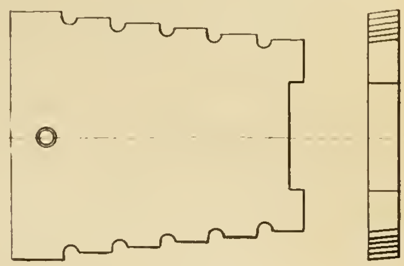


Fig. 4.

man, aided by a stiff bar, well made and with cutters so arranged that the four holes could be bored, reamed and the bosses faced. The overall dimensions of the castings made a long bar necessary. In order to have it as stiff as possible it was made just small enough to pass through the small end of the smaller taper hole in the rough. This allowed a bar three inches in diameter.

Flat cutters were used for all operations. These were made of high-speed steel b-finish ½-in. thick. The boring cutters for the straight holes were made about 2 inches long and to bore about 1-32-in. under the required diameter, 6 inches, allowing that amount for the reamer to remove. The reamer was made of flat stock of the same quality, but an inch longer and up to full diameter of the hole. The casting was sawn through on one side, through these holes; and in order that there might be no kick, the cutting edge of the reamer was made spiral as much as the thickness of the stock would allow, which was about ⅜ of an inch. Fig. 2 shows the boring cutter and the Fig. 3 shows the reamer. The hole left by these cutters and reamers was all that could be desired and the process gave entire satisfaction.

For finishing the taper holes, cutters as shown in Figs. 4 and 5 were used. Previous experience in this work had shown that the flat cutter for taper holes would be the best to use, and little trouble was anticipated. The roughing cutter, Fig. 4, is a stepped affair. The steps being turned in the lathe and backed off by hand with a file. This

style of stepping converts the cutter into a multiple boring tool, as it produces a series of concentric steps and requires very little power to remove the scale and an absence of the screeching that generally accompanies the operation of tapering reaming is conspicuous. Following this up by the reamer shown in Fig. 5, a taper hole was produced

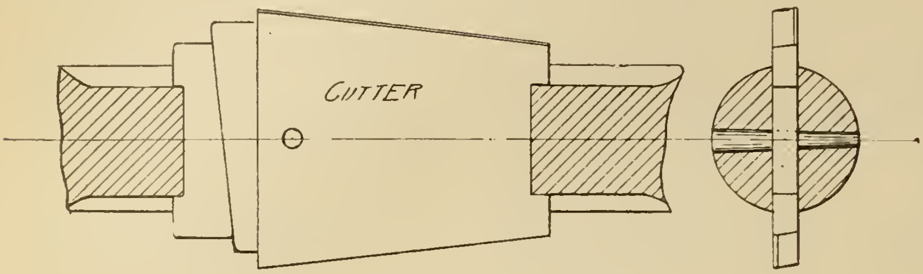


Fig. 5.

straight and true to size and taper, and with a degree of smoothness that is pleasing to observe. A total absence of chatter marks was a notable feature.

For facing the bosses a cutter somewhat larger than the boring cutter was used and was held in position in a similar manner.

Construction of Boring Bar.

It is obvious that in order to make one bar answer the purpose for the operations of boring, reaming and facing it must be necessary to make the cutters so that they may be changed for each operation. As the cutters used in this case were all of the same thickness it became possible to use the same slot for holding the cutter for each different operation. The slot thus must be made long enough to take the longest cutter, which is the cutters for the taper holes. These cutters were held in place by means of the seat at the front end and the wedge at the other, as shown in Fig. 5. The shorter boring and reaming cutters were held in a similar manner, the space caused by their shorter length being filled by the blocking, as shown in Fig. 2.

The bar was, on account of its great length, a difficult proposition to slot. As shown in Fig. 6, the two slots had to be worked out. The following proceeding was followed :

On the tool room floor, there was a tool room boring machine with a horizontal spindle that seemed more fitted for this work than any other machine available. Very few machine tools after they have had any amount of usage are strictly accurate, and very little dependence should be placed upon them until tested. This fact made it impossible to use many methods that were suggested, that would otherwise have made the job much easier to handle. However, it is such variety that forms the spice in the humdrumness of machine shop life.

Since it was desired to get out this work with the least possible cost, consistent with accurate results, no attempt was made to have any part of the bar interchangeable. This decision saved considerable puttering, as when a part of the work reached the good enough stage it was considered about right.

On the table of the tool room boring machine were strapped two blocks of equal height, into which the bar was strapped. The spindle having been brought square with the bar by means of a swinging trammel in the spindle hole, a small drill about 5-16-in. was placed in a chuck in the spindle, and, through centre of the bar and in a proper location lengthwise, a series of holes were drilled, these holes being drilled as close together as was possible without one breaking through into the other. When these holes were all drilled, the drill was replaced by the counterbore shown in Fig. 7, this counterbore being made somewhat smaller—five-thousandths—than the required width of the slot, the leader being made to fit the holes already drilled and used to guide the counterbore. By these means the greater amount of the stock in the slot was removed, leaving ragged sides. These sides were smoothed out by means of the milling tool shown in Fig. 8. There were two of these tools made, one being the same size as the counterbore and the other up to the size of the slot. The teeth on the end of the tool was used as an outer support, having a bearing in the tail support bushing in the tail stand of the boring machine. The table of the machine on which the blocks were strapped was fed by hand during this operation, as it was thought to be too much of a risk to throw in the automatic power feed. This same thought prevailed throughout the job, and the motto, "make haste slowly" was kept in mind at all times.

In order that the cutters might have the best possible seat the ends of the slots must be worked out square. This was done by using the slotting tool shown in Fig. 9. This tool was gripped in the chuck and the spindle locked against turning, and, by working the spindle back and forth through the slot, the ends of the latter were worked out square and true.

The extension of the slot to allow the overlap of the wedge-backing and the cutters was next milled by using a narrow plain milling cutter on an arbor; supporting the latter in the tail stock. After the cutter was set in place on the arbor, the bar was rotated in the V's, and the slot set to the cutter so that the extension would come true with the slot, as was necessary.

Owing to the length of the bar each slot was finished separately.

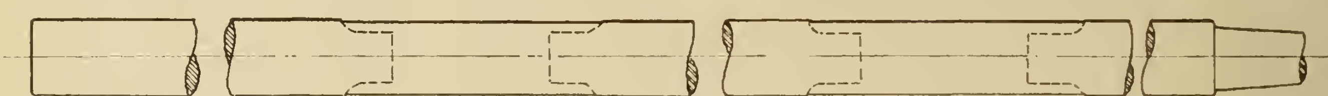


Fig. 6.

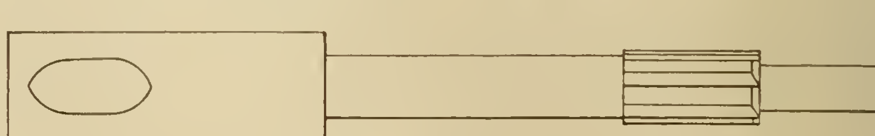


Fig. 7.

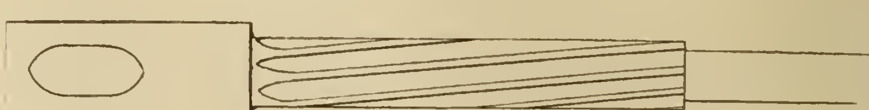


Fig. 8.

The flat stock had been planed to the proper thickness and ground on the surface grinder for finish. The recess was also made in the end. The wedges were also made. The cutters were then fitted in place and the taper pins located and the wedges fitted. The cutters and

wedges were marked with an identifying mark, so that they could be replaced properly, as they were not interchangeable in the slot with respect to either side of the bar. This precaution was necessary. We might here mention that the taper pins were used to make doubly sure that no accident could occur, due to the loosening of the wedge. These pins were not fitted until the cutter had been forced against its seat.

tres. To this piece the cutters were clamped. They were centred by using an indicator on the turned edges and grind them so that when the cutters were replaced in the bar they would revolve true with its axis.

After this was all done, the cutters were ready for hardening, and some apprehension was felt as to the result; but they came out flat and true and were of fine temper. The cutting edges were

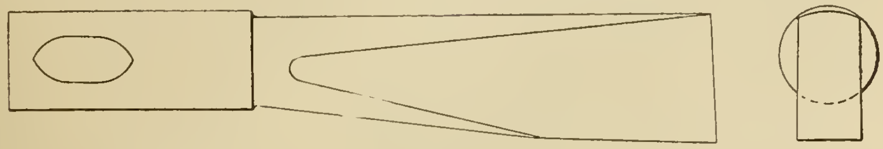


Fig. 9.

then stoned to shape and ready for use.

The bar, on account of its length, had to be sent out to be turned and ground before we did any work on it. But in order that we might turn the cutters, while in place in the bar, some way had to be found by which it could be done. This was accomplished by butting the tail-ends of two similar lathes together and turning the tail stock on one around. This combination allowing the bar to be swung between centres. In this way the cutters were each in turn turned to a size somewhat over the finish size; but in each case central with the axis of the bar. The taper cutters were turned by using the compound slide. A power feed rig for this slide was arranged, as shown in Fig. 10, which needs no further explanation.

The results that were obtained by the use of this bar were beyond the expectation of any concerned and the little problems encountered during its get-up were spicy and embracing.

If one could be set continually at the solving of such problems we would hear no talk of monotony in machine shop work.

PRACTICAL QUESTIONS AND ANSWERS.

Mechanical Efficiency.

Ques.—What is the mechanical efficiency of a steam engine?

Ans.—The ratio of useful work to the total work is called the mechanical efficiency, so if 30 per cent. of the power

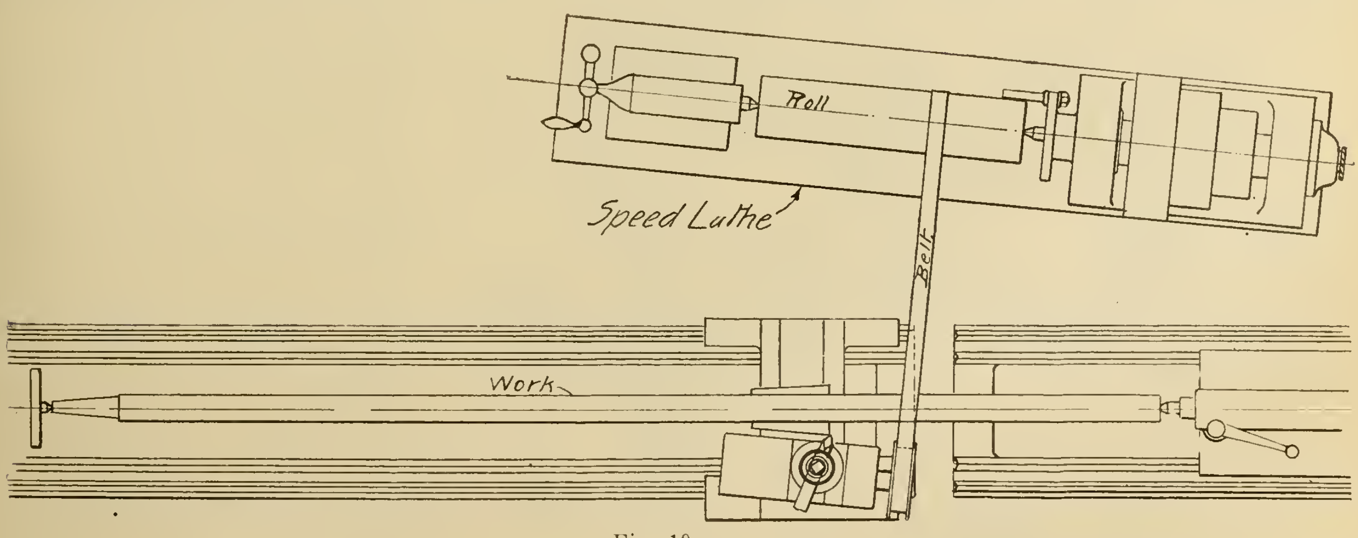


Fig. 10.

is absorbed in engine friction the mechanical efficiency is 70 per cent. The efficiency of engines varies from about 70 to 95 per cent. and is equal to $\frac{B.H.P.}{I.H.P.}$

The I.H.P. is obtained in the usual way by means of the indicator while the brake horse-power is obtained by a Prony brake or other similar brake. In ascertaining the brake horse-power the number of revolutions per minute is noted by a speed indicator, and the stress or pull indicated by a spring balance or weights.

The B.H.P. $= \frac{2 \pi r N P}{33000}$ where r=horizontal distance from centre of spring balance to centre of shaft in feet. N=number of revolutions per minute. P=pull in pounds, measured by a balance or weights. Since $\frac{2\pi}{33000} =$ 0.0001904, the B.H.P.=0.0001904 R.N.P.

To illustrate mechanical efficiency herewith is given a test of a small mill engine: For card 1 the R.P.M. was 304, the I.H.P. 5.3 the pressure 17 lbs. and the arm 3.5. This gave A.B.H.P. of 3.4 and an efficiency of 64.1 per cent. In card 2 r.p.m. was 304, I.H.P. 7.78 and p. 30 lbs., giving a B.H.P. of 6.04 and an efficiency of 77.5 per cent. Cards 7 and 8 showed an efficiency of 91.25 per cent., showing that the limit of efficiency had been reached. In card 7 the r.p.m. was 288 with pressure 105 lbs., in card 8 the r.p.m. was 252 with a pressure of 120 lbs. In both cases the engine indicated 22.23 h.p. and gave a B.H.P. of 20.6, giving the efficiency in each case as 91.25 per cent.

Kilowatt and Horse-power.

Ques.—The newspapers are full of questions of power and mention freely kilowatt horse-power. Will you kindly tell me the relation between these two quantities?

Ans.—Electrical power is measured by the kilowatt or 1,000 watts. One horse-power is equal to 746 watts or 1 kilowatt equals 1.3405 h.p. A current of one ampere with an electro-motive force of one volt is one watt. A current of 10 amperes and 74.6 volts will do the same work as one horse-power.

After all the cutters were turned true some means by which they might be held during the milling and grinding operations was necessary. It is obvious that these operations could not be done on them while they were in place in the bar. A short piece of stock was procured. This was slabbed off on one side ½-in. below the centre, leaving the stock on the ends to accommodate the cen-

Tommy Fairfield's Experience With an Automatic Machine

Telling of an Apprentice's First Experience with an Automatic; Tommy is given the Job of Running the New Automatic by the Superintendent

By ONLOOKER

Bang!

The devil apprentice jumped.

"By jingo!" he exclaimed, and dashed for his lathe. Too late, however. His finishing tool had struck the shoulder, with disastrous results to the tool. Bill looked ruefully at the damage done.

"I'll have to dig up some of the buried tools of the night gang," he soliloquised aloud.

"Youse kids only aughter be allowed ter run them new-fangled antermatic marchines," said old Tom Blair, the veteran of the shop. "When I was a yonker like youse, I never got runnin' good marchines. I mind an ole lathe in ther shop made most all out er wood."

"What's an automatic machine?" asked the angel.

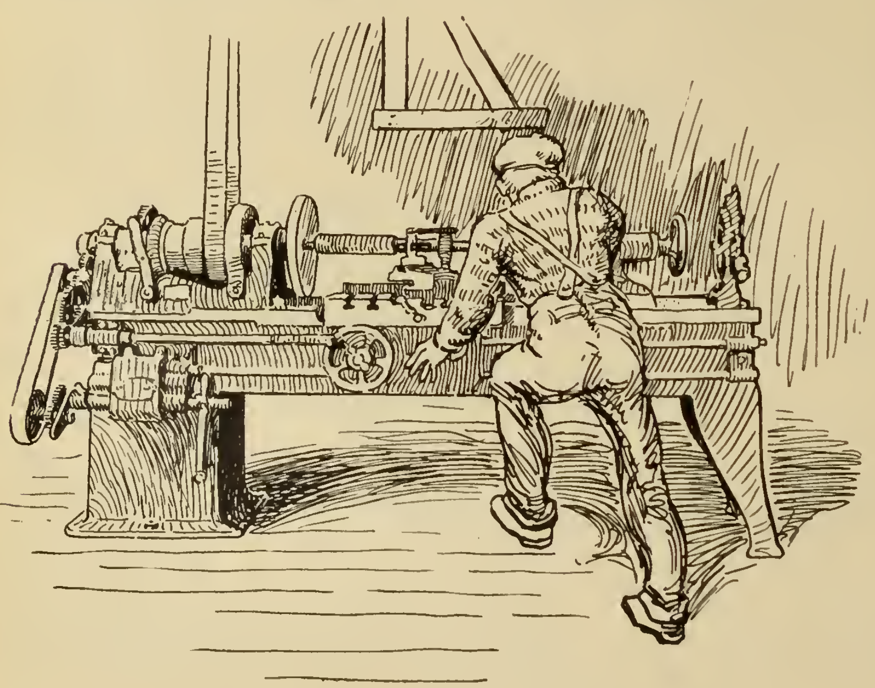
The angel was Tommy Fairfield. He never got into mischief and always did what he was told. He was a bright little chap, but very credulous, and the other boys guyed him a good deal. He was dubbed "the angel" by common consent. Tommy knew of lathes, planers, slotting machines and other machines around the shop, having made good use of his eyes since his mother had placed him under the superintendent's charge some months before, but an automatic machine he had never heard of. He carried tools to and from the tool room.

"Wal," said the old grey-haired man, "I don't just know as how I can tell you 'xactly. I can't just keep up with all them new fangled things, but I knows they cuts gears with 'em, and I knows ther boss says as we don't need 'em round a railroad repair shop. I hears him tell that to a guy as was sellin' 'em."

"I'll tell you all about them," broke in Bill Sykes, who hadn't had enough devilment for one morning. "An automatic machine is a kind of machine which you just have to start and then all the work is done without you having to look at the machine even. They do a whole lot of things at the same time, too. It's like having a lot of different machines made up into one; and you can do planing and turning and slotting and the rest of it all at the same time."

Tommy's mouth was open, and his eyes bulging from his head.

"Don't guy the lad," said old Tom, but the Angel never heard.



"By Jingo!" he exclaimed, and dashed for his lathe.

"Say! but it would be a big machine," he exclaimed at last.

The Devil grinned, and the Angel started with a couple of tools for the tool room.

Tommy was a thoughtful boy and he pondered on that automatic all the rest of the day, and he wondered why Mr. Jacobs (the superintendent) didn't buy a machine like that, that would do so much work all at the same time, and without being watched.

As Tommy and his mother sat eating their none too sumptuous supper that night, he plied her with questions about the wonderful machine. His mother didn't know much about it; in fact, she couldn't have told a planer from a lathe; but she thought that perhaps the other boys had been telling him stories.

"No!" Tommy assured her, "because the old man who is so good to me started telling me about it."

Tommy was still thinking of it when he went to bed.

* * * * * * * * * *

Next morning Tommy hadn't been in the shop long when the Superintendent sent for him. Mr. Jacobs took quite an interest in Tommy for his mother's sake, and because Tommy was a willing little chap.

"I have a new job for you, Tommy," said the superintendent. "You have been carrying tools for two months now, and I am going to advance you."

Tommy was glad, and thought he would get assisting some machinist, as the boy before him had done, and he hoped it would be Tom Blair, the old man who was so kind to him. But Tommy was mistaken.

"We have a new machine in the shop," continued the superintendent, "an automatic machine. It isn't hard to run, and I am going to let you try it."

"An automatic machine," exclaimed Tommy excitedly. "Is it big, and will it do the work of all the other machines in the shop? That's what Bill Sykes told me, and you only need start it, and it does all the work itself? Is it all true?" and Tommy's eyes glowed with excitement.

The superintendent smiled indulgently, as he always did at Tommy.

"Yes," said he, "that's about it, only you have to be careful in running it, not to get hurt."

That's what he had told Tommy repeatedly, that he must be careful not to hurt himself, and not to interfere with anything he did not understand.

"Now, I will show you how to run it," said the superintendent, as he led Tommy out through the shop to the machine.

Tommy felt quite proud as he walked past the other apprentices, and he didn't speak to any of them. Wasn't he going to run the automatic machine! Then they came in sight of the ma-

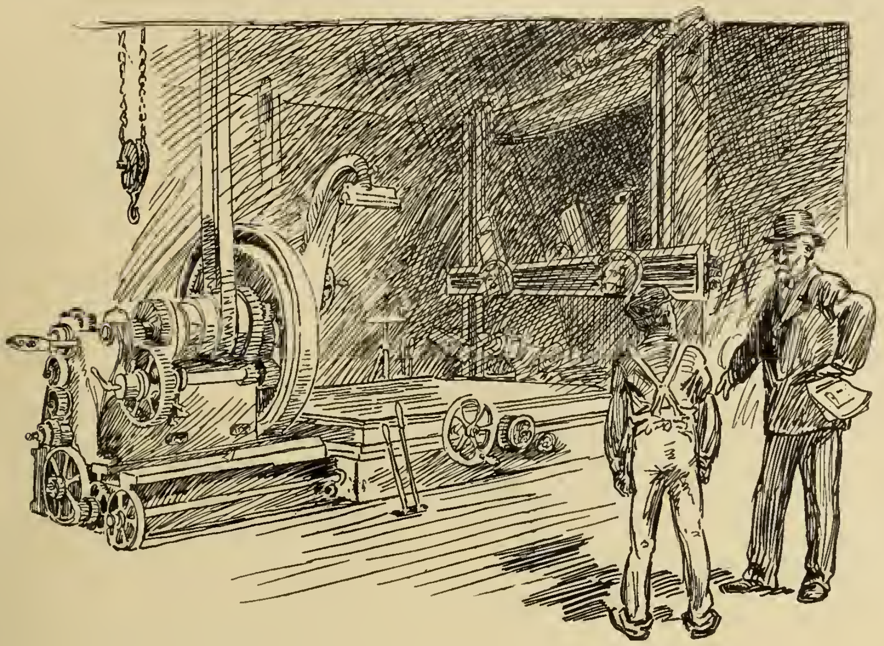
chine, and Tommy began to be afraid. The machine was so big it reached to the roof nearly, and Tommy could make out nothing but wheels, and gears and cutting tools and frames. At first it looked most like an immense planer—but then it wasn't, and he could make out the heavy frame of a big slotting machine, and it then seemed more like a slotting machine. But then he saw the cone pulley belonging to a lathe and he looked for the tailstock—but there didn't seem proper connection between them. Tommy was bewildered. Just then the superintendent threw over a lever, and Tommy saw a shaper head moving backwards and forwards; it seemed to come out of the side of the planer. The superintendent started to explain how to run it.

"You put your work down on that table (Tommy saw the table for the first time) then you move this lever, and those jaws come up and hold it."

Tommy saw the jaws come up, but they seemed to come from nowhere, and he forgot which lever it was, there were so many. Still the superintendent seemed to think it was easy, so Tommy didn't say anything.

"Then," continued the superintendent, "you see we want to turn up the end of that, plane the two sides and drill two holes in it (often had Tommy heard the foreman giving instructions like that to some of the machinists, and he wished he was back carrying tools.) To do this you pull over these levers (Tommy had given up trying to keep track of levers) and then you turn this wheel, and the machine starts."

And it did start, Tommy could not exactly see how the different operations were performed, but they were done somehow. The lathe tool seemed to be revolving about the work, instead of the work revolving, and he wondered how it was it didn't strike the table. The drill was operating at a spot on the work, over which the planer tool passed every few seconds. Tommy's head grew dizzy, and the whole machine seemed enveloped in a mist, through which he would catch occasional glimpses of every machine he had ever seen. Tommy looked at the superintendent, and he, as well as the machine, seemed to be in a mist. But then he spoke and Tommy saw him plainly, but lost sight of the machine. The superintendent was smiling down at Tommy.



"You put down your work on that table——"

"Well, Tommy," said he, "I think you know all about it now, and I will leave you to do all the work you see piled up there."

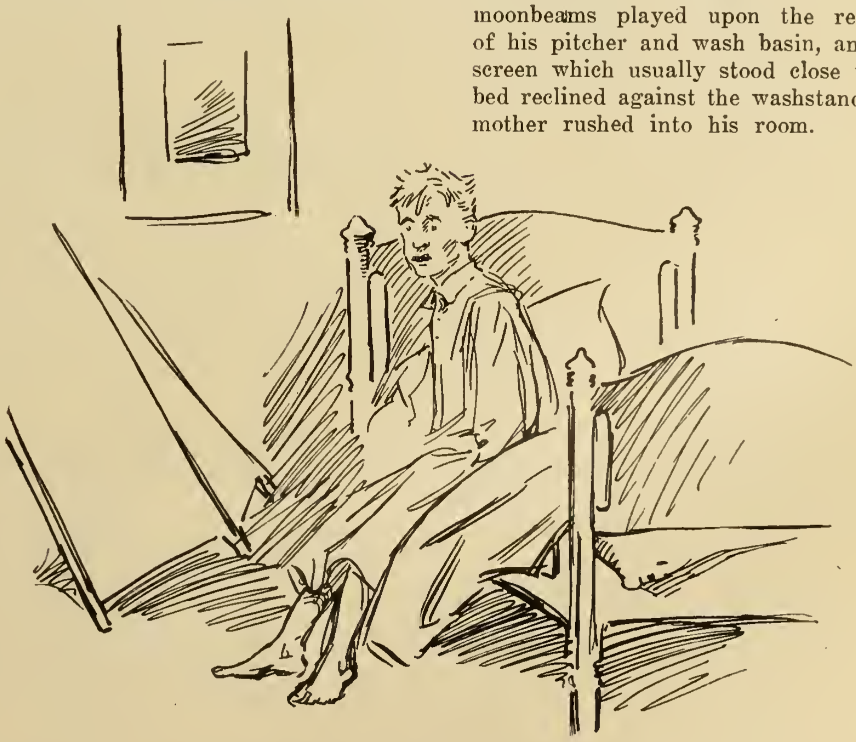
Tommy was terrified, and tried to tell the superintendent not to leave him, but somehow the words would not come. He tried to shout, but could not. Then he burst out crying, the strain was too much. But the superintendent did not seem to notice, and walked away.

No person seemed to notice Tommy. No one came to help him, and it seemed to him that he cried for a long time. Then he saw the pile of work and the machine, which again looked like an immense planer.

"I must do that work," thought Tommy, "else Mr. Jacobs will tell mother I don't do what I'm told."

Tommy rose resolutely and approached the machine. He pulled one lever, and there was a suspicious buzz, but nothing happened. He pulled another lever and everything seemed to go Tommy became giddy, and turned a wheel. There was a crash, and the whole machine seemed to tumble to pieces.

Tommy shrieked—and awaking found himself half out of the bed. He sat up and looked around in a dazed way. He expected to see the ruins of the machine all around—but instead, the moonbeams played upon the remains of his pitcher and wash basin, and the screen which usually stood close to his bed reclined against the washstand. His mother rushed into his room.



Tommy Shrieked—and Woke Up.

"What's the matter, Tommy? What's happened?" cried the mother.

"Oh, mother!" cried the relieved Tommy, "I thought I was running an automatic machine."

MACHINE SHOP METHODS AND DEVICES

Unique Ways of Doing Things in the Machine Shop. Readers' Opinions Concerning Shop Practice. Data for Machinists. Contributions paid for.

JIG FOR MILLING GIBS.

I enclose here with sketch of jig for milling gibs for power presses. The gib is shown in Fig. 3 ; the holes, (a, a, a,) are for the purpose of bolting the gib to the frame of the press. The gibs are of cast iron and square on both sides, at (b) is a groove milled at an angle of 45 degrees, with each face making an angle of 90 degrees, as shown.

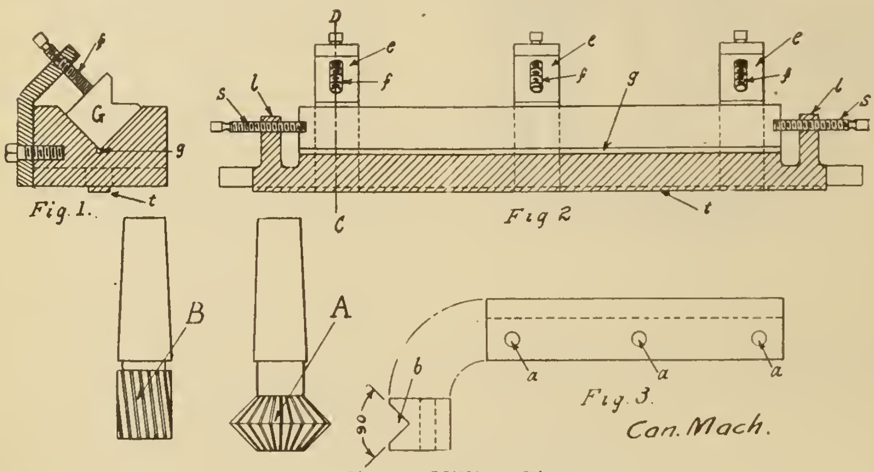
Until this jig was made they had been clamping them flat on the table and using cutter (a), but could not get them quite correct.

Since this jig has been in use, using a plain cutter (b), better results have been obtained.

Fig. 1 shows a sectional view of jig through (c d).

The tongue (t) is for keeping the jig square with the table ; the groove (g) is to allow both sides of the gib (G) to rest flat on the jig.

The pieces (tt) with screws (ss) are for end adjustment. Three angle pieces (ecc) are bolted on the back and the screws (f f f) are to clamp the gib securely in place.



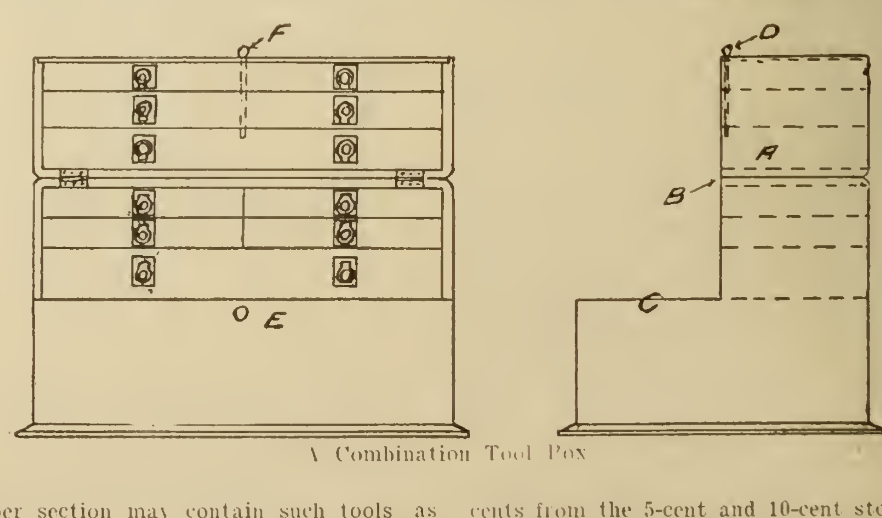
Jig for Milling Gibs.

A COMBINATION TOOL BOX.

These two sketches show the principle of a tool box which I had made for myself ; and I have found it to be very convenient.

It is made of quartered oak, ⅝-in. thick, for the box itself, and having the corners all dovetailed, making it very strong. The dimensions inside are 16 inches long, 10 inches wide, and 9 inches deep, just long enough to take an ordinary hammer. It has a large space at C, Fig. 2, 10x10x1 inches deep for large tools; and if desired a small tray may be put in here for small chisels or wrenches.

There are eight drawers, varying in depth from ⅞-in. to 2 ins., four long drawers and four short, as shown. The drawers are furnished with small brass handles, those in the upper section, A, being put on upside down so that when section A is swung over on the hinges, at B, the handles will fall in place, otherwise they would strike and the top would not come together properly. The upper section has a small hole drilled through the top and the fronts of the drawers to insert a pin, as shown at F, to keep the drawers in place when turned over. The drawers should be made with the bottom projecting over the side about 3-16 inches to slide in the groves in the side of box, thereby giving more depth to the drawers. The upper section may contain such tools as squares, scales, combination sets, etc., as they may be fastened in by small screws, loose tools being placed in the lower drawers, as they are not upset. When the box is opened it should be like Fig. 1 in front and Fig. 2 at the side, when section A is folded over against the part C it forms almost a square, and having the corners square and a lock at E the box is complete.


A Combination Tool Box

HOW TO MAKE LOOSE LEAF HANDBOOK FOR $1.

By George P. Pearce.

You can never buy a handbook that contains the special data, tables and records that belong to your particular business, no matter whether you are superintendent, foreman, draftsman, toolmaker, machinist or apprentice.

I attempted to keep all my special data in a large note book, with alphabetical index, but this soon proved a hopeless failure, as similar data became widely scattered throughout the book; tables which were in the first pages had important additions half way through, the revised table further and possibly more additions to the revised table later. It was this way with most of the data, and the note book finally became a chaotic mass of information, and the alphabetical index was as awkward as the book.

After putting up with this unsatisfactory method for some time, I finally adopted the following plan for making a loose-leaf notebook : First, I bought for 50 cents a flat-opening loose-leaf binder for 8x10½-inch sheets, which is regular letter size typewriter paper ; then a common ticket puncher for 10 cents from the 5-cent and 10-cent store, and 200 sheets of 8x10½ inch typewriter

paper, which cost 40 cents. I then got a strip of tin 1x10½ inches, and punched two holes in it the exact spacing of the rings in the binder, which I used for a template when punching holes in the typewriter paper. The next thing towards the preparation of the notebook was the index. For this I went to the library, borrowed their Dewry Decimal Classification book and copied out of the relative index the subjects I intended to include in my note book, together with their numbers. In collecting this index I aimed for classification more than close detail. For instance, take gearing ; I divided that into spur, bevel, worm and special, this subdivided it as close as was essential for my needs. The index comprised 60 double lines and covered my special field as thoroughly as I wished. Next I carefully went through my old notebook and revised it wherever necessary; then I took it to a typist and got her to typewrite all the tables, data, etc., on the punched sheets and number them according to their classification ; these I placed in the loose-leaf binder in numerical order. Next I took the charts; some of these I cut out and carefully pasted on the punched sheets, numbering them according to class, and the others, which could be added to or improved I carefully redrew on the punched paper and filed them in their placés.

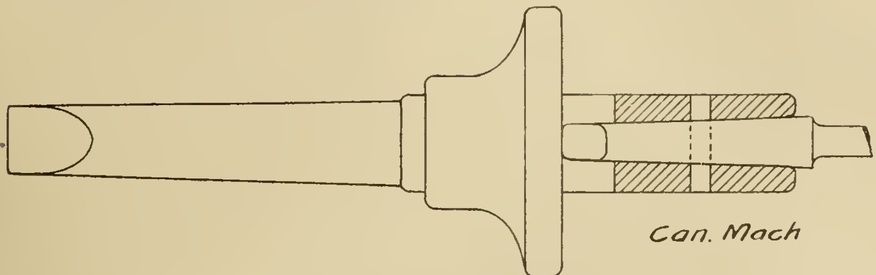
Now, as I make new tables, charts or gather important data I always put it on one of the perforated sheets, number it according to its classification and insert it in the binder, thus making a loose-leaf notebook, which possesses the following advantages over all others :— All data on any given subject is automatically classified together; data is quickly available ; when any data becomes old or is revised, the old sheet is taken out and replaced with the new ; it contains all the special information that is from time to time gathered and which is extremely valuable to your particular needs ; it is always "live" and is of unlimited capacity, as when one binder becomes filled, the data can be divided and half put in a new binder and so on.

This is the most satisfactory solution of the notebook problem I have ever seen and the total cost, not including the typewriting, is only $1.

TO AVOID BROKEN DRILL SHANKS

By A. E. D.

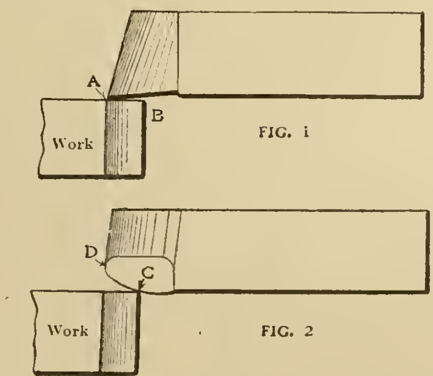
In one shop where I worked I had drilling to do where there were thousands of the same kind of castings to drill. The corners of the top of the drill twisted off and the drill had to be taken to the forge shop to be drawn out before it could be used again. The trouble with this method of repairing was that afterwards the drill would not run true, and I broke the small drills on the bushings of the jigs. Where there was only one sized drill to be used I used the manner illustrated to overcome the difficulty. I tapped the drill into the socket with the copper hammer and drilled a three-sixteenth-inch hole through the socket and drill-shank. I hammered in a three-sixteenth-inch pin and cut it off flush with the socket. When I wanted to sharpen the drill I removed both socket and drill from the spindle of the drill press. When the pin is flush with the socket there is no danger of bruising the hands or tearing the shirt sleeves.



To Avoid Broken Drill Shanks.

GRINDING SLOTTING MACHINE TOOLS FOR HEAVY CUTTING.

The usual type of slotter tool, as used in bars for heavy work, is shown in Fig. 1. This tool, although exclusively used in this country, (England), is to my mind decidedly wrong ; for instance, the cutting edge first comes in contact with the work at the extreme point, marked A. As this is the weakest point of the tool, it makes it very liable to break when it strikes the work it is operating on, and also upon the return stroke, even if the bar is provided with a frictionless return. The point of the tool strikes the work at the extreme full depth of cut first, which is some distance from the outside edge, B. This puts on additional stress, due to the fact that the point has to force or punch its way through the solid material. The stronger or back part of the cutting edge comes into contact when the point has separated the chips ; therefore, its work is very much lighter, although it is the strongest part of the tool. I think most readers of the American Machinist will agree that this is one of the "things that are generally wrong."



Slotting Machine Tools for Heavy Cutting.

The tool shown in Fig. 2 is free from the above mentioned drawbacks and will stand much more severe work without showing any sign of weakness. It takes less power to drive it for the same depth of cut than Fig. 1 takes ; instead of the weakest part of the tool striking the work first, it comes in contact at the point marked C, which is the strongest part of the cutting edge, and, striking the work on the outside edge, gradually chips or shaves its way along until it comes to the extremity D, which is the highest point. The strongest part of the tool C having commenced to separate the chips, the point, D, has not such severe duty to perform. Further, not having a pointed end, as at A, there is not so much danger of breaking it off. I have seen this tool used on heavy steel crank forgings, taking a roughing cut off 1½ inches deep, with a feed of 40 per inch. The tool. 4x11-16-inch section, stands up to its work perfectly and is a revelation to those accustomed to using the one shown at Fig. 1.—American Machinist.

IRON AND STEEL INSTITUTE.

The annual general meeting of the Iron and Steel Institute, Sir Hugh Bell, Bart., president, will be held at the Institution of Civil Engineers, Great George Street, London, S.W., on Thursday and Friday, May 14 and 15, according to announcements issued by Bennet H. Brough, secretary. The annual dinner will be held under the presidency of Sir Hugh Bell, Bart., in the grand hall of the Hotel Cecil. The autumn meeting will be held in Middlesbrough, Sept. 29.

The council will shortly proceed to award Carnegie research scholarships.

In order to be included in the voting list at the general meeting applications from candidates for membership of the Institute must be received at the office of the Institute, 28 Victoria Street, London, S.W., by March 24.

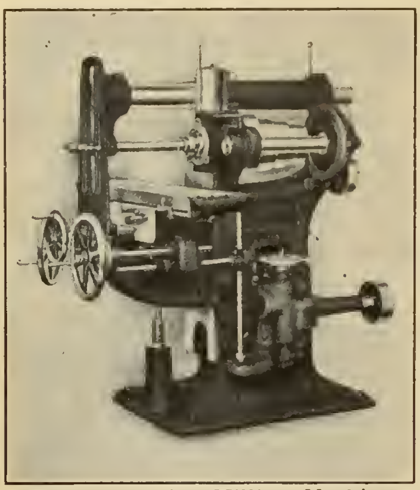
Some Features of English Milling Machines and Practice

Writer Takes Prominent Machines as Examples—Gives Useful Data and Hints to Makers and Operators, Particularly Care of Milling Cutters

By H. A. CARTER

The existence of the milling machine is justified firstly by the quantity of metal it will remove in a given time; and secondly, by its capacity for reproducing complex or irregular forms any number of times without measurement. The No. 1 pillar milling machine, made by Messrs. Alfred Herbert, Ltd., Coventry, Eng., is specially adapted for light and rapid milling on jobbing and manufacturing work. The hand machine is fitted with a rack and pinion feed operated by a lever. This gives a very rapid and sensitive feed. This machine is recommended for use where the cuts to be taken are short, and the actual milling operation does not last long enough to enable an automatic feed to be used to advantage.

The automatic feed machine is recommended where the cuts are longer, being provided with automatic trip motion to the feed. These machines are specially adapted to be run in gangs on repetition work, one operator attending to a number of machines.



Type of English Milling Machine.

Features of Horizontal Milling.

The patent horizontal milling machines made at Edgwick Foleshill Foundry embody every convenience and provision for quick handling. They have been designed with a view to producing the highest class of output in the shortest possible time. Attention has been centred strongly on the feeding arrangements. Some of their leading features are :—Great range of spindle speeds in geometrical progression, crucible steel spindle with large taper hole, and screwed nose; large soild steel overhanging arm, improved form of arm-brace, patent dial feed motion, all feed gears steel automatic, and dead stops, no hole needed in floor for elevating screw, all movements governed by hand wheels, no changing handles from one motion to another, large adjustable index discs to all movements, clamping levers to all movements, and improved pump arrangement and piping.

The combination of special features found in these milling machines cannot be met with in those of other makers. The body, head and base are one casting. The sleeve in which the overhanging-arm is fitted is a tube, and braces the head of the machine solidly. The overhanging arm is a large and solid steel bar. The arm brace is rigid, and at the same time easy to adjust and remove; and on some machines forms an additional bearing for the arbor, enabling the arbor support to be used as an intermediate bearing when using a gang of milling cutters on heavy work.

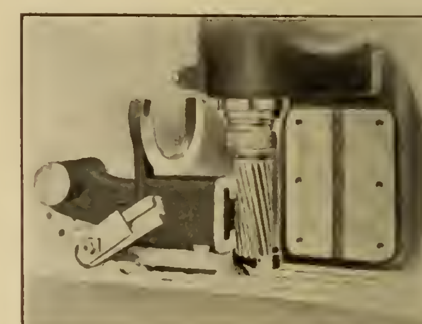
The spindle has adjustable conical bearings at the front, and an adjustable parallel bearing behind. The spindle is bored through, and has a clutch drive. The arbors are secured by a draw bolt. The nose of the spindle is threaded so that cutters of large diameter may be screwed direct upon it, and a protecting cap is provided to save the thread from injury. The spindle noses are bored to standard tapers. The spindle runs in the right-hand direction, enabling twist drills and reamers to be used when desired. The cone pulley and gearing give all speeds in geometrical progression, and the whole machine can be operated from the front without the attendant changing his position. Each motion has its own hand wheel, so that there is no necessity to change handles when making adjustments. The longitudinal adjustment is controlled by the hand wheel on the operator's right hand. The transverse adjustment is by the centre hand wheel. The vertical adjustment is made by the hand wheel and angular shaft at the left hand side of the machine. The screw is telescopic, doing away with the necessity of cutting a hole in the floor. The automatic feed is operated by a patent dial feed motion, which, to obtain any speed, is rotated until the number upon it corresponding to the feed required comes opposite the pointer. No other movement is required and the feed is read directly from the disc.

Features of Vertical Millers.

Vertical milling machines are made by this firm for routing, profiling, cone cutting, die sinking, "T" slot milling, recessing, surfacing, edge milling, circular milling, keyway cutting, cotter hole milling, and under-cutting. The spindle in these is driven by speer gears, or by belt alone. No bevels are employed. There is a patent dial feed motion, quick return movement to table. The table is driven by screw, it is long and suitable for long objects or gangs of objects. All gears are enclosed. Slides are protected from cuttings.

Milling Machine Attachments.

The usefulness of milling machine attachments frequently depends on the attachments with which it is furnished, and Messrs. Herberts make a number of valuable standard milling machine attachments, one of the best of which is their circular milling attachment for horizontal machines, which is graduated and has an ample trough for catching oil and chips. It has a worm wheel of quick pitch, giving a rapid rotary movement for setting, and also a slow feeding arrangement giving great power, and a very fine motion for feeding. An illustration is given. The circular table is very solid.



Milling an Automatic Screw Machine Slide.

Points About Handling Milling Machines

There is no tool more efficient than the milling machine when properly equipped, and on the other hand, the efficiency of which can be more reduced by improper care and operation. It is not well to attempt to adjust these machines without understanding their mechanism. To secure the best results, machines should rest on a firm foundation, preferably of stone or of concrete, not less than 18 inches deep. The ma-

chines should be carefully levelled up to a bearing on cement, but do not require to be bolted down. The counter-shaft should be attached either to the ceiling or to a wall, and the brackets carrying the belt-shifting bars, can be fixed in various positions on the hangers to accommodate different arrangements of belt drive. The belt-shifting bars are operated by a compound lever, giving a minimum arc of movement to the hand. The pulleys for driving the feed from the counter-shaft are driven by an independent belt, and the forks should be arranged so that this belt is on the centre loose pully when the main driving belts are on loose pulleys.

Care of Milling Cutters.

A good milling cutter will serve you well if you treat it properly. It must be of good material and correct design, properly hardened and tempered ; above all things, it must be sharp. Its speed and its feed must be adapted both to its own nature and to the work; and its use must be directed by intelligence and discrimination. In many instances the milling machine and its cutters are looked upon as finishing tools only suitable for removing microscopic amounts of metal, and in the majority of these cases this impression has been created by the use of improperly designed cutters running at unsuitable speeds and feeds.

Ever since the introduction of the cutter-grinding machine milling cutters have been capable of taking heavy cuts at a low cost for maintenance, and the recent introduction of high speed has rendered the milling cutter a more efficient tool than before. All cutters made by the firm are heated in special furnaces to temperatures which are exactly regulated by delicate pyromaters, and the tempering is conducted on the most modern principles. The result of these accurate methods is that the cutting edges are uniform, and of correct degree of hardness, giving a long life to the cutter and enabling a high cutting speed to be used.

For rapid work milling cutters should have teeth of coarse pitch. Fine pitch cutters get clogged up with chips, and the teeth are weak, and will not stand a heavy stress. The small sectional area of fine pitch teeth does not carry the heat away quickly enough, and in many cases the cut taken by each tooth is not enough to enable it to get fairly hold of the work. Theoretically, the thickness of the cut taken by one tooth of a cylindrical cutter begins at zero, and increases gradually up to a maximum at the point where the tooth leaves the work. What generally takes place, however, in practice is that the tooth slips over the work until the pressure produced is sufficient to overcome the elastic flexure, and the play of the parts, and then takes hold suddenly.

Each tooth of the cutter should have enough cut to enable it to enter the work at once. When the cut per tooth is very fine the cutter will not take hold at all unless it is absolutely sharp, the action being similar to that of a broad finish turning tool used in a lathe, which, as is well known, will not take a light cut if it is not perfectly sharp. Coarse pitch cutters are practically free from these objections. They can be run faster than fine cutters, as they do not clog. They will take a much heavier cut per tooth, as the teeth are stronger, and provide more room for chips and lubricant. They do not heat up so much, as there is more cutting and less rubbing in their action, and they are much easier to grind as a general rule. The smaller the diameter of the cutter the better will be the result produced; small cutters are cheaper, they work with less friction, as the arc of contact with the work is shorter, they require very much less torsional effort to drive them, and, therefore, cause less spring of the arbor and stress to the driving mechanism. They travel a less distance than larger cutters to pass completely over the work.

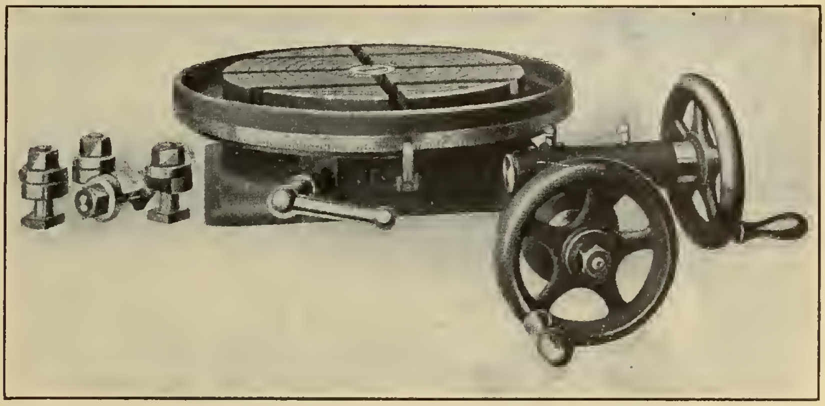
In general, the milling machine may be said to be the most accurate of machine tools for manufacturing work, as it is more frequently possible to dispense with finishing cuts in the case of milling than with any other form of machinery.

The face cutter, or end mill, will produce more perfectly flat surfaces than the side cutter, because the finish is not appreciably affected by irregularities in its teeth, the surface is generated by the rotation of the cutter, and apart from considerations of wear, even a single tooth will produce a perfectly flat surface. Side cutters, on the other hand, reproduce their outline on the work, and the flatness of the surface milled, therefore, depends on the accuracy of the grinding. Eccentricity, or want of running teeth in a side cutter, also produces corrugations, or rotation marks on the work. Where extreme accuracy is not required, however, side cutters are of great utility, as they enable wide surfaces to be machined at one pass, and are more convenient than face cutters for use on horizontal machines.

From the point of view of accuracy undue importance is apt to be given to the feed marks produced on the work by the rotation of a cylinder cutter. In most cases the depths of these marks is very much less than their appearance would seem to indicate. For example, suppose a $1\frac{1}{2}$-inch cutter having ten teeth to feed 1-5 of an inch per turn, equals 1-50 of an inch per tooth the height of the ridge produced will be less than .00007, supposing the cutter to run true, a figure which is quite negligible, although the marks can easily be seen.

A fringed cutter should be run more slowly than an ordinary cutter and care should be taken when grinding to keep all the faces of the teeth exactly radial or the correct form will not be produced by the cutter.

With expanding cutters where it is necessary that the width should be kept exactly, constant cutters can be made in halves; the two portions overlapping so as to permit of packing them out as they wear, and to compensate for the amount ground off the sides when sharpening. Inserted tooth cutters for this purpose can be adjusted by setting the alternate teeth in opposite directions axially.



Circular Milling Attachment for Horizontal Machine.

For successful milling it is necessary to keep all arbors and collets in good condition. Special care should be taken with the distance collars on the arbors, since, if these are not perfectly parallel on their faces, the action of tightening up the nut will bend the arbors, and cause the cutters to run out of true. The same result is produced by chips or dirt between the faces of the distance collars.

It is hardly possible to urge too strongly the advisability of sharpening milling cutters frequently. If a cutter is sharpened as soon as the first sign of dullness presents itself very little grinding is necessary.

FOUNDRY PRACTICE AND EQUIPMENT

Practical Articles for Canadian Foundrymen and Pattern Makers, and News of Foundrymen's and Allied Associations. Contributions Invited.

CONVENTION PREPARATIONS.

Active preparations are now being made for the holding of the convention of the American Foundrymen's Association, the Foundry Supply Association and other allied associations, in Toronto during the second week in June.

As was reported in the last issue of Canadian Machinery, a preliminary meeting was held, at which the time of the meeting was decided and other general features. Since then many of the details have been worked out. Chairmen for the various committees have been chosen, as follows. Convener of Committees, L. L. Anthes, Vice-President American Foundrymen's Association; Chairman of Entertainment Committee, Fred. Somerville, manager of Somerville Brass Co.; Chairman Finance Committee, Robt. Cluff, manager King Radiator Co.; Chairman Grounds and Building Committee, Peter McMichael, manager Dominion Radiator Co.; Chairman Press, Printing and Programme Committee, W. P. Near, president Page-Hersey Pipe Co.

H. M. Lane, secretary Foundry Supply Association, expects to be in Toronto on March 2, and it is thought that the meeting of the Executive of this Association will be held in Toronto at that time.

It is expected that this will be the largest convention ever held, and Canadian foundrymen will have a splendid chance to study all new foundry equipment, and all the recent developments in foundry practice. The more Canadian foundrymen there are present, the greater will be the success of the convention, and all should make a point of keeping that week, second week in June, open for a visit to the convention.

SEMI-STEEL CASTINGS.*

By David McLain.

I shall only give you facts that we found while trying to overcome a rather difficult proposition in our iron foundry. Here I have a sample casting of the job. When I requested our machine shop foreman to allow me to take this casting, I told him what it was wanted for, and asked him what he saw in our semi-steel to condemn, and he said: "Not a thing. Ninety-nine machinists out of 100 would say that it is a good close-grained iron, and would never imagine it is semi-steel."

When we began experimenting with this pattern, our loss was from 40 to 50 per cent., and we had no means of telling how the castings were going to be until after the final operation in the machine shop, when they would be tested at 150 pounds air pressure, and either be accepted or rejected. As these castings, finished, cost our firm $2.52 each, one can see that the loss amounted to quite an item. In this connection, I might mention that at that time our machine shop cost was $1.50, as against $0.82 now, due to the adoption of the premium system.

Before this our firm had been buying these castings from local foundries and others, and the loss was always from 40 to 50 per cent. After a considerable length of time we reduced this to 25 or 30 per cent.

We tried charcoal iron, and did everything we could with it. We talked with some of our foundry friends about the job, and tried what they advised, but with no better results. About this time our foundries were overstocked with all parts of our product, with the exception of these cylinder heads, and as orders were slow in coming in, our foundries, iron, steel and brass, were closed, and the cylinder head patterns sent to a concern which made a specialty of this class of work. We thought our troubles were at an end with this job, but it was just the same old story. Castings would look fine, but when tested were no good. We even had a few of the castings fly to pieces while being tested. We took an analysis of the foreign heads, and while the castings were regular in the composition, still the loss would be 50 per cent. and over when tested.

The first heat we made in semi-steel was very encouraging to all appearances, but not so in the machine shop. The castings would be hard, or have hard spots in them and so on. There was always something wrong. If the castings were soft they would leak. On some heats we would not try to machine the castings, but discarded them, as they were so hard.

After going over the same ground for a couple of months and not securing satisfactory results, we decided to drop semi-steel, at least for the present. The analysis of the metal made averaged within the limits as follows: Silicon, 1.25 to 1.74 per cent.; manganese, 0.44 to 0.77 per cent.; phosphorus, 0.54 to 0.65 per cent.; sulphur, 0.094 to 0.155 per cent.

We then started to make the castings from our regular metal. I always thought it queer that no more attention was paid to the percentage of phosphorus and sulphur that was carried, and the way I figured was about this. If one uses a high percentage of steel, he should try and secure as low a percentage of sulphur and phosphorus as possible. Try to get iron, that is, a local foundry iron with these metalloids pretty well down. We knew that the manganese would take care of our sulphur, but as manganese converts graphitic carbon into combined carbon, it means that your castings will be too hard. That is the general supposition, and is probably so, if there were no silicon in the metal. But as silicon converts combined carbon into graphitic carbon, and one should aim to carry about 1.75 per cent. silicon, let these two metalloids fight it out, and see what the results are.

As manganese has a greater affinity for oxygen than for iron, we lost quite a large percentage of manganese, but as it removed the sulphur, all was satisfactory. The first heat tried proved a success, and it has been the same ever since.

The analysis of our metal at present is as follows: Silicon, 1.65 to 1.75 per cent.; manganese, 2 to 2.50 per cent.; phosphorus, 0.45 to 0.50 per cent.; sulphur, 0.04 to 0.05 per cent.

It is made of Thomas iron, which I consider the best for semi-steel in this part of the country. We have run as high as 45 per cent. steel, and the only danger in carrying such a high percentage of steel is in the handling of the metal. It seems almost impossible to carry such a per cent. and still have a nice metal in such a thin section as one-quarter inch in some places.

The plan we always follow in calculating a mix for semi-steel is to take an iron 0.35 to 0.45 per cent. phosphorus or lower; 0.025 to 0.035 per cent. sulphur; manganese, 1 per cent. or higher. The silicon in our iron varies, but as the amount of silicon determines the percentage of steel, that is all one has to look out for. If our silicon runs 2 per cent. we can carry 30 per cent. steel; if 2.25 per cent., then 35 per cent. steel, and so on, always watching, of course, that we have 1.65 to 1.75 per cent. silicon in our casting. Then we add enough manganese, in lumps about the size of an egg, to our charge to give about 2 to 2.50 per cent. manganese in the casting, always considering that one will lose from 1 to 2 per cent. in the cupola.

* Read before the Milwaukee Foundrymen's Association.

Making of Steel Castings in Ontario Iron and Steel Plant

Process of Making Steel Castings as Carried on at Welland; Open-Hearth Furnace Construction and Operation; Motor Driven Rolling Mills; General Description of the New Plant

During the last five years the steel casting industry has made wonderful progress. Many machine parts and other pieces, which formerly were made of wrought iron, are now steel castings, the cost being reduced thereby. There is now a large demand for steel castings. For this reason a description of the making of steel castings, as carried on in the new plant of the Ontario Iron & Steel Co., Welland, should be of interest.

Fig. 1—The Chipping and Cleaning Department in Cast House.

This company, which numbers among its stockholders many of the stockholders of the Page-Hersey Pipe Co., and practically under the same management, completed their plant in Welland very recently; and, in fact, only part of the plant is yet in operation, the steel casting department. The open hearth steel billet furnace and the rolling mill have but been tested, and are not operating as yet. This plant when operating complete, will turn out all kinds of steel castings, steel billets, rails, bars and angles, and is in a position to do jobbing pattern work.

The main buildings consist of the cast house (150x165 feet), (where steel castings are made), open hearth furnace house (175x75 feet), and the rolling mill (300x100 feet). They are all steel and brick construction, the Berlin Construction Co., Berlin, Conn., being contractors, and the Hamilton Bridge Works doing all the fitting.

The making of the steel castings will first be considered. The steel casting building is divided into three bays, the middle bay forming the molding department, one of the side bays, the chipping department and sand storage, and in the other bay is situated the 20-ton open hearth basic furnace. The central bay is served with a 30-ton Niles crane, and the two side bays with 5-ton cranes of the same make. The equipment of the building includes: Two mold drying ovens, 21x60 feet each; one core oven, 9x15 feet.

Fig. 2—The Molding Floor in Cast House.

The chipping department is provided with air hammers and chippers, air being supplied at 100 pounds' pressure, by a two stage Canadian Rand compressor, belt driven by a 180 h.p. Canadian Westinghouse induction motor. The compressor and receiver are enclosed in a separate room next the cast house. In the chipping room is a shaper, shown at A, Fig. 1, for machining locomotion frames and cutting off sprues from castings and similar work. There is also a Norton grinder for doing general work. These machines are group driven with 15 h.p. induction motor.

At B, in Fig. 1, is shown a sand crusher and mixer, which does very efficient work. This is belt driven by induction motor. At C, in same figure are the sand bins.

In the foreground of Fig. 1 are shown some of the styles of castings made.

In Fig. 2 is shown the molding floor, which consists of, as before stated, the central bay and part of one of the side bays. At BB will be seen the pneumatic jib cranes used. The floor is equipped with several molding machines for repetition work. At A is shown the 20-ton open hearth basic furnace.

It may be of interest to explain the significance of "basic" furnace, and to do that we will have to go somewhat into the manufacture of steel castings.

There are two distinct processes of open hearth steel making, the "basic" and the "acid," the difference being in the lining of the hearth of the furnace.

The "basic" is lined with magnesite, a substance known chemically as a base, which substance will not only resist the high temperatures, but is but very slightly affected by a slag highly charged with lime. The "acid" lining consists of silica sand, known chemically as an acid. In acid practice the process is practically a melting one, whereas in basic practice the melting stock is refined as well as melted by the introduction of a flux, ordinarily limestone, the function of which is to form a slag that will readily absorb the sulphur and phosphorus of the charge, and act as a vehicle for the oxidizable silicon, iron and manganese.

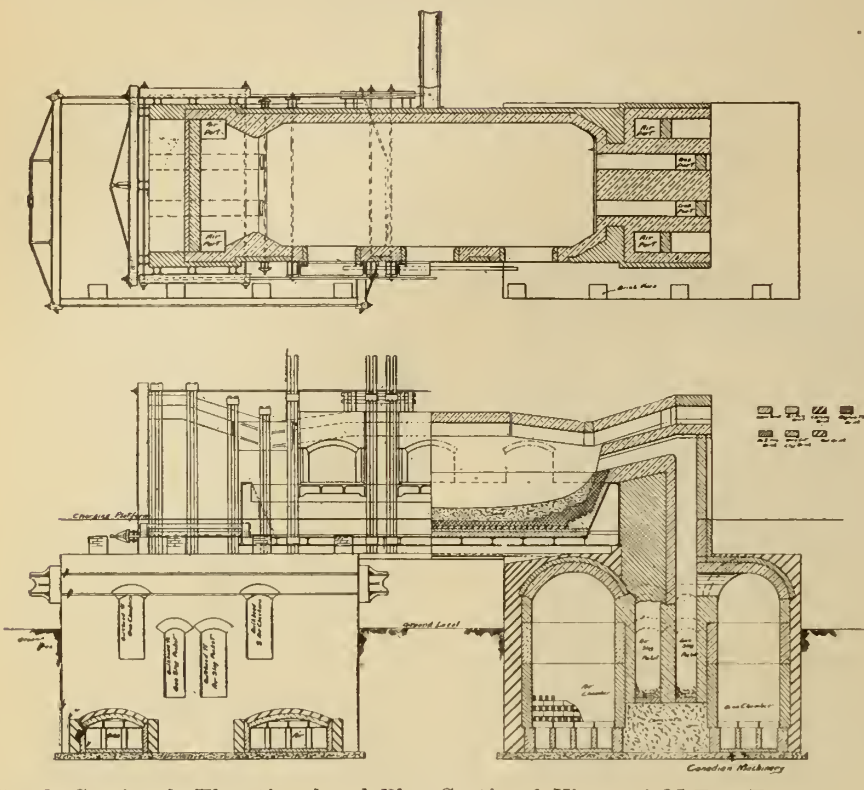


Fig. 3—Sectional, Elevational and Plan Sectional Views of 25-Ton Furnace.

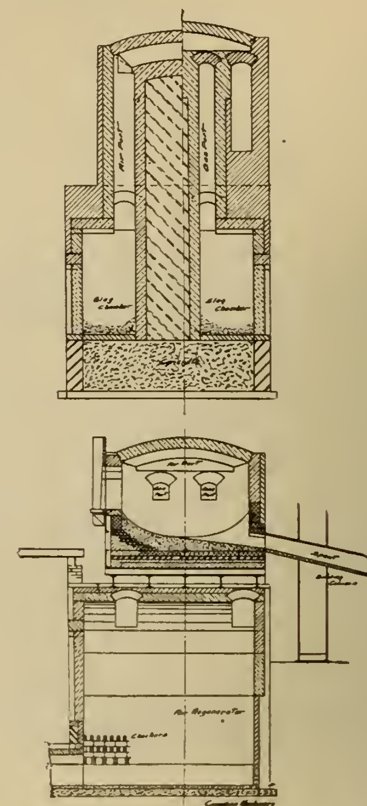


Fig. 4—Sectional View of 28-Ton Furnace.

The chief advantage of the basic over the acid process is the flexibility of the former in the selection of melting stock. The acid process being a melting one only, the melting stock must contain the same proportion of the elements as is desired in the finished castings. But it is only in regard to quantities of sulphur and phosphorus that there exists the distinction between acid and basic melting stock. The melting stock for both processes consists of pig iron and scrap. Pig iron for ordinary and practice analysis, as follows.

Total carbon...... 2 to 3.5 per cent.
Silicon ....0.50 to 1.5 per cent.
Sulphur ... .0.04 or less
Phosphorus ... .0.04 or less
Manganese ... .0.50 to 0.75

The "basic scrap" consists of the product of rolling mills, following basic practice, and is bought on chemical specifications, but only as far as sulphur and phosphorus are concerned, the physical nature of the scrap predetermining the composition in regard to carbon, silicon and manganese. A representative analysis of this scrap is:

Sulphur ... ...$0.015 to 0.03 per cent.
Phosphorus . ..0.010 to 0.03 per cent.

The pig iron necessary for the basic process is "standard basic," the following analysis showing the greatest amounts of these elements allowable:

Silicon ... .1.00 per cent.
Sulphur ... .0.05 per cent.
Phosphorus ... .1.00 per cent.

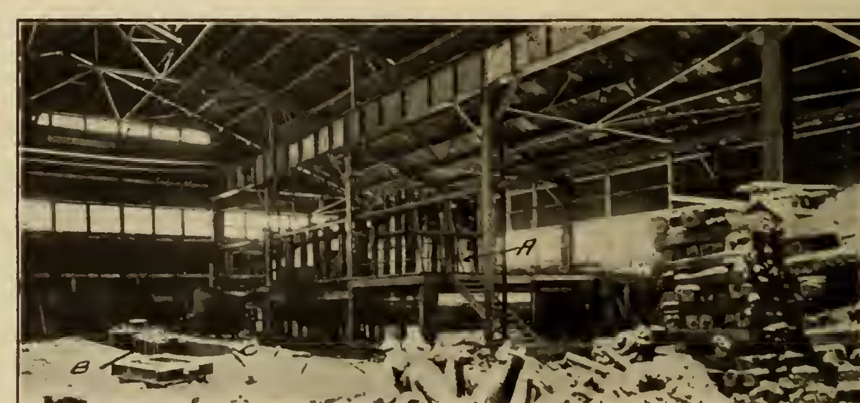


Fig. 5—The Open Hearth Furnace Building.

The scrap used is not considered chemically, but is physically known as heavy scrap, consisting of rails, steel castings, draw bars, fish plates, etc.

The basic process needs very intelligent handling, and considerable melting skill to get good results.

From what has been said the reader will have an idea of the basic process as used in this plant. The next thing to be considered is the construction of the furnace and its operation. Figs. 3 and 4 are views of the 25-ton open-hearth basic furnace for the rolling mill, but the 20-ton furnace installed in the foundry does not differ very materially from this one. This furnace is shown at A. Fig. 2.

Construction of the Furnaces.

The principles of construction are the same in both basic and acid practice: but there are two classes of furnaces, stationary and tilting. The furnaces in this plant are stationary. The advantages of the tilting furnace, the facility

of completely draining of the furnaces, is offset by its initial cost. Sometimes trouble is experienced in the stationary furnace because of "hard taps," caused by the material used to temporarily close the tapped hole becoming fused.

The construction of the furnaces is well shown in the line drawings and in the outside views of the two furnaces at A. Fig. 2, and at A, Fig. 5.

The areas of the hearths of both furnaces are the same, namely, 216 sq. ft., 24 ft. long and 9 ft. wide, giving a hearth area of 10 4-5 sq. ft. per ton capacity for the 20-ton furnace, and 8 2-3 sq. ft. per ton capacity for the 25-ton furnace.

The important consideration in the furnace construction is the regenerator chambers, since they assist materially in getting fuel economy by storing up the heat from the waste gases and utilizing it to preheat the air and gas. This is done by having a double set of regenerator chambers as shown in the line illustrations, one on the left and the other on the right side of the furnace. Following the course of the air and gas from right to left. the reversing valves directs the air and gas to travel through their respective brick checkerwork chambers on the right side of the furnace, the gas igniting upon reaching the furnace body and passing over the hearth. The burnt gases pass down through the brick-checkerwork chambers on the left side of furnace, the brickwork absorbing a good deal of the otherwise waste heat. After a time (15 or 20 minutes) the valves are reversed, and the gas and air take the very opposite course, absorbing the heat from the chambers on the left side of furnace, This is the system of heat regeneration. As the heat is continued the furnace becomes hotter because of this regeneration.

Fuels Used in Welland Plant.

This plant is very advantageously situated as far as fuel is concerned. The furnaces are arranged to burn natural gas or oil fuel, and at present both are being used alternately. The company own their own gas wells, but they sometimes have trouble in getting all the gas required, and then the oil is used. The oil is stored in tanks outside the buildings, and is pumped to the burner, the style of which is shown in Fig. 6, with a steam pump made by the Union Steam Pump Co. In the burner the oil is atomized by a steam jet. Producer gas is often used as fuel in other plants, but practice so far has shown oil to be more satisfactory. Natural gas is, of course, the most satisfactory fuel, because of its cleanness and high thermal quality.

These furnaces were designed by J. A. Herrick, M.E., and installed by the Industrial Gas Co., New York.

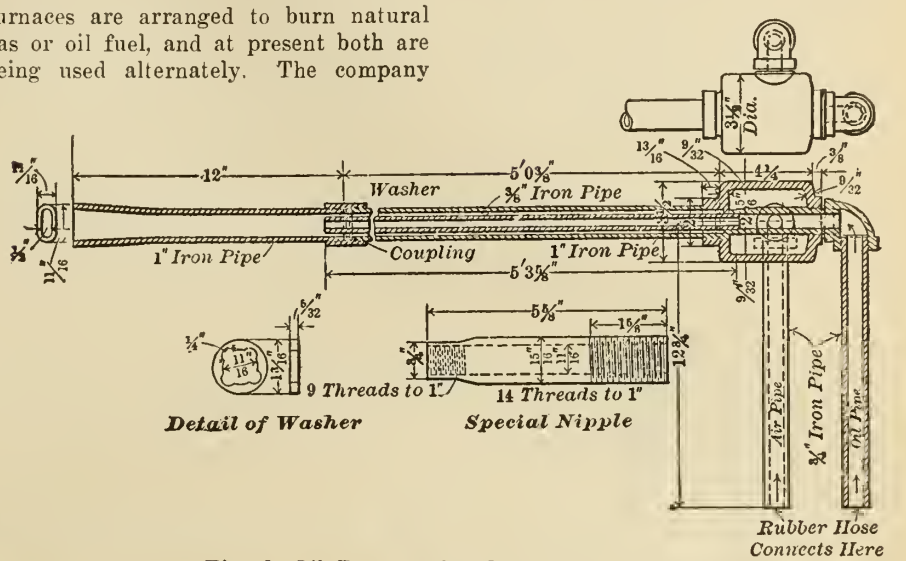


Fig. 6—Oil Burner for Open-Hearth Furnace.

Fig. 7—View of Rolling Mill.

The Resulting Steel Castings.

Steel castings are now being used for so many purposes that formerly wrought iron were used for, that it would be interesting to compare cast steel with wrought iron.

Open hearth steel castings are made by pouring liquid steel of limited composition into molds of silica sand; whereas wrought iron is worked up from plastic masses of partially or completely decarbonized cast iron prepared in the

Fig. 8—View of Rolling Mill, Shears in Foreground.

puddling furnace. As far as chemical and physical qualities are concerned, there is not a great deal of difference between the two.

There is more trouble had with blow holes and shrink holes in steel castings than iron castings, chiefly because of the greater amount of shrinkage in the metal when cooling. But the chief difficulty with steel castings is their liability to crack in the mold. This is due to "red shortness." Sometimes this is due to the condition of the metal and sometimes to the improper distribution of metal in the light and heavy sections of the casting. The greater amount of shrinkage in steel castings is liable to cause cracking unless proper precaution is taken in molding.

Flaws, such as shrink holes, sand holes, cracks, etc., in steel castings can very often be repaired by welding. This is done at this plant by the electrical process, a full description of which will appear in the next issue of Canadian Machinery. There are many other processes in use, including the well-known thermit process. The department where the electric welding is done is shown at D, Fig. 1.

Open-hearth Building & Rolling Mill.

The 25-ton furnace, supplying metal for the ingots for the rolling mill has been fully described. This is situated in the open-hearth building, shown in Fig. 5. Provision has been made in this building for another furnace of the same capacity. As before stated, the rolling mill department has not commenced operations as yet, which accounts for the snow in the buildings. At B, in Fig. 5, are shown the molds for the steel ingots; and at C is one of the ladles used.

Figs. 7 and 8 show two views of the rolling mill. The building is equipped with a 10-ton Niles traveling crane.

When the ingots come from the open-hearth building they are heated in the continuous heating furnace, shown at A, Fig. 7, a cross section of which appears in Fig. 9. From the furnace they are sent through the 22-inch rolling mill in the foreground of the same figure. From this mill the ingots are conveyed by means of the motor driven rollers, shown at A, in Fig. 8, to the Moore & Whiting, motor driven shears where they are cut into sections and conveyed to the outside of the building, where they are piled. From here they go to the second heating furnace shown at B, Fig. 8, from where they are delivered to the 12-inch mill shown at C, in Fig. 8, where they are rolled into the finished product.

A very interesting feature of the rolling mill is the driving of the two sets of rolls by electric motors. This was adopted because of the cheapness of electric power in that vicinity. In Fig. 10 is shown the motor driving by rope drive, the 22-inch mill. These two motors are closed in as shown at B, Fig. 7, and at D. Fig. 8, to prevent accidents. These motors are Westinghouse, 3-phase induction motors, running on a 2,200 volt circuit. The motor driving the 22-inch mill is an 800 h.p., and that driving the 12-inch mill is a 500 h.p. motor.

The company make their own rolls, and have two special lathes for turning them up, made by Hogg Iron & Steel Co., Pittsburg. Both these lathes are motor driven, and are situated at E, Fig. 8.

The Transformer Building.

Fig. 11 is a view of the transformer room, showing the transformer departments, the switch board and the motor-generator set. At A is shown one of the three Canadian Westinghouse oil and water cooled transformers, stepping down the three phase current from Niagara from 12,000 to 2,200 volts, which is used by the rolling mill motors. In the other three stalls are three Packard transformers, stepping down to 200 from 12,000 volts, used by the machine tool and crane motors which are induction

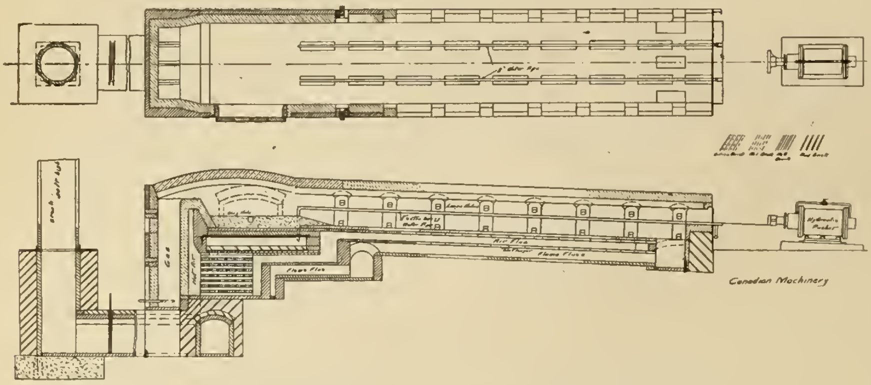


Fig. 9—Continuous Heating Furnace in Rolling Mill.

Fig. 10—Motor Driving 22-inch Rolling Mill.

Fig. 11—Transformer Room.

motors, and also by the induction motor of the motor generator set, shown at B, supplying D C power at 120 volts for arc lighting, operating magnets on switchboard and for the electric welding. The switchboard, shown at C, is Canadian Westinghouse make, and consists of six panels. The method of wiring is plainly seen in Fig. 11.

The Machine Shop and Pattern Shop.

In connection with the plant there is a machine shop, occupying part of the rolling mill building. The equipment includes a new Kempsmith milling machine, supplied by London Machine Tool Co., new Pratt & Whitney lathe and a John Bertram steam hammer. Some old tools include MacGregor Gourlay miller, John Bertram shaper, radial drill and lathe, Sturtevant blower. The tools are group driven by an induction motor.

The pattern shop is a building by itself, well equipped, and the company are in a position to do job pattern work. The pattern storage building is a fireproof building.

The company have 15 acres of land adjacent to the Welland Canal, having G.T.R. and Michigan Central sidings, thus having excellent shipping facilities. They have a steam locomotive for yard work.

D. H. Blaney is superintendent and works manager.

Cores and Core Mixtures for the Foundry[1]

Hints for Core Making: Machine Made Cores and Core Machines; Best Mixtures for Machine Cores, Giving Results of Recent Experiments.

By GEO. H. WADSWORTH[2]

A common fallacy among foundrymen is that one core mixture will suit a wide range of foundry conditions. The facts are that in a foundry it may be profitable to have a number of separate and distinct core mixtures, using entirely different grades of core sand and binders. From this it is clear that each class of cores must receive separate consideration, and this must cover the core room, the foundry and the finishing departments.

It is necessary on the one hand to take account of what we have to deal with, and on the other, what the results are which we hope to achieve. The term core, as it is used by foundrymen, has been defined as a body of sand projecting into an opening left in the mold to form a hollow in the casting. Later, however, the term has come to have a broader significance, and the portion of it which we have to deal with covers only such cores as are made by the core maker and delivered to the molder for insertion in the mold.

In accordance with this, we may define a core as any body of sand which is made and baked and then introduced into a mold, either to form a hollow in the casting or to form one face in the mold, as in the case of covering cores.

Properties of Cores.

A core must be porous so as to provide a ready passage for the gases as they escape when the metal is being poured about the core. At the same time it must have sufficient strength to resist the wash of the metal. The composition of the core must be such that it will burn brittle when exposed to the metal, so as to crush as the metal shrinks about it, thus relieving the casting from unnecessary strains. This is especially true in the case of cores used for brass and aluminum castings. The core must also burn brittle enough so that it will clean from the casting easily, and in some cases it is important that the surface be of such a nature that it will give a perfectly true, clean, parallel hole free from rough scale.

Undesirable Mixtures.

One great objection to many core mixtures is that they contain material which, when exposed to the heat of the metal, gives off gases which are injurious, or if not, at least troublesome to the molders, and no matter what advantage binders of this kind may possess, the foundryman will always try to supplant a binder giving trouble from gas by one giving a practically odorless gas.

Another point which must be considered is that the core mixtures must be cheap; but a cheap core mixture may mean a dear casting, and, as stated above, not only the core room, but the foundry, cleaning room and machining departments should be taken into consideration when selecting core room materials.

In all core mixtures which come under the scope of this paper, sharp sand forms the principal portion of the body of the core; the remainder of the material being known as the bond. Water in a core mixture plays the part of an agent for rendering the bond active previous to the baking of the core.

Bonds for Cores.

Bonds may be divided into two classes, natural and artificial. The natural bonds practically all belong to the clay class, that is, they are some alumina product. Sand frequently contains a certain amount of alumina or clay, which is frequently known as loam. For some classes of work this forms an efficient core bond, but in the case of brass, aluminum, or grey iron, it often burns so hard during casting that it is very difficult to remove the core when the clay is present in large quantities. Machine made cores fill the gap between the exceedingly small and delicate and very large cores. Large cores are rarely required in such quantities as to warrant the use of a machine in their production, while small cores, and particularly those which are of irregular shape, require special treatment, and when required in quantities must be made in metal boxes frequently provided with carefully fitted core wires.

A word in regard to such cores may be of interest. Where these cores have to stand up against quite a body of metal, it is often necessary that they are made exceedingly stiff. This necessitates the use of core wire. The ordinary annealed iron wire is too soft for this purpose. Some foundries have overcome this difficulty by stretching the wire about 20 per cent. of its length, which hardens and stiffens it. The same result may be attained by having the entire wire annealed. Such wire as this is being manufactured by one firm in this country.

The mixture for small cores should be made of good sharp silica sand and some good strong core binder. The expense per pound of mixture is a consideration which drops out of sight entirely in comparison with the necessity for having strong, accurate cores which can be handled and will not fail when the metal strikes them.

Machine Made Cores.

We will now consider the class of cores known as machine made cores.

The first machine that we developed was one to produce cylindrical cores from 1 to 1½ inches in diameter. Dies were afterward fitted to this same machine, which enabled it to make cores to 2¼ inches in diameter down to ⅜ inches. At first it was supposed that only cylindrical cores could be made, on account of the fact that it was observed that the core as it came from the die always rotated. Later, however, an attempt was made to produce square cores, and as this proved successful many other irregular shapes of prismatic cross section have been made.

It was natural that some foundries would demand larger cores than the

1.—Read before Chicago Foundry Foremen's Association.

2.—Inventor of Wadsworth's core machines.

first machine could produce, and a new one was designed known as our No. 2 machine, which had a capacity for cores up to 5 inches in diameter. This was successful, and the design was later changed to produce cores up to 7 inches in diameter.

When the first machine was introduced it was intended to be operated by hand, but in response to the demand which came from certain customers, power attachments were supplied. When the large machine was designed it was intended as a power machine only, but experiments showed that by using a large fly wheel it was possible to make any size core by hand, and later there came an inquiry for a machine capable of turning out slab cores, and to meet this demand the multiple spindle slab core machine was designed.

Multiple Spindle Machine.

The next step was naturally to use the multiple spindles for turning out several cores in parallel.. The next inquiry received was one that at first staggered us. It was for a machine to make small square cores which should not vary more than 2-1000 of an inch above or below the required size; in other words, should be held within 4-1000 of an inch as the total limit of error. To accomplish this the multiple spindle principle was applied, special dies being designed.

Core mixtures form an important part of the core machine business. They vary greatly, depending upon the size of the core used and the available material. As in all core mixtures, sharp sand is the basis. Flour has also been found to be a good binder for most core sands, but it has also been found advantageous to add a small quantity of boiled linseed oil to the mixture.

For very small cores, a relatively larger amount of oil and flour is required, and the amount of water will cause the sand to pack in the dies and block the machine. The larger the die the smaller the amount of binding material necessary, and the larger quantity of water the mixture can carry.

Standard Mixtures.

Certain standard mixtures have been developed and recommended as a basis for experiment, but as the core sand used in each district is liable to vary from that used in other districts, the natural bond in the sand will have a varying effect, and hence the amount of bond to be added is dependent upon local conditions. The following mixtures are recommended:

Mixture for gray iron, cores 3/8 to 2 1/8 inches—12 quarts silica, lake or clear sharp sand, free from loam or clay; 2 quarts flour, 1/2 pint boiled linseed oil.

For cores 2 1/4 to 7 inches—15 quarts sharp sand, 3 quarts of Zanesville or a loam sand, 3 pints flour, 1/2 pint boiled linseed oil.

Mixture for brass and aluminum castings—4 quarts silica or good sharp sand, 2 quarts brass molding sand, 1/4 pint boiled linseed oil.

The more water the mixture will carry the harder and stronger the core will be when baked.

No. 1 core mixture for steel castings 1/2 to 2 1/4 inches—6 quarts silica sand, 1 quart flour, 1/4 pint boiled linseed oil. This mixture is used without grinding.

Cores 2 1/2 inches and larger—18 quarts silica sand, 3 quarts fire clay, 1 1/4 quarts flour, 1/2 pint boiled linseed oil.

These steel mixtures must be very thoroughly mixed by hand when a more suitable way is not obtainable.

The fire clay can be increased or decreased according to the hardness of the core with the sand being used.

No. 2 mixture for steel castings 1/2 to 2 1/4 inches—6 quarts silica sand, 1/4 pint boiled ilnseed oil, 1 1/2 pints flour. This is ground together thoroughly in a mill.

2 1/2 inches and larger—6 quarts silica sand, 3 pints flour, 1/4 pint boiled linseed oil.

We know that in practice many foundries have departed a long way from these mixtures, but believe that the formulas given above will serve as a guide in working out core machine mixtures.

In some cases all cored holes are bored in the machine shop. Under these circumstances, a perfectly smooth hole is not necessary. It is only essential that the core leave the casting readily, and that it does not leave a hard scale in the hole. This may usually be accomplished, by the use of a good grade of sand and a moderate amount of flour and oil in the binder.

It is of interest to note that with the advent of the core machine many agricultural implement manufacturers have discovered that machine made cores can produce true, round, parallel holes which will vary less than 1-100 of an inch in diameter, and that by the use of suitable blacking on the cores these holes can be cleaned perfectly, so that shafts may be safely run in bearings which are cored to receive them and are given no subsequent machining. In a like manner wheels are run on axles without machine work. In fact, the machine made core has revolutionized the design of several agricultural implements and other castings in which machine made cores are used.

We have been carrying on a series of experiments with a large variety of core mixtures to determine what is best for use in our foundry and also in the foundries of many users of these core machines. Some of the materials experimented with have been interesting. Some years ago the black loam from a celery swamp was tried in core mixtures with sharp sand, and it was found that when this was dried and ground, tempered and put through a core machine, it produced a core which left the work readily and gave a remarkably clean hole. The vegetable mixture contained in it shrinks in the oven and gives ample vent to the core, and burns out in the casting, causing the core to become very rotten. Great care must be taken in baking such cores as they will burn very easily. It is probable, however, that it would be difficult to obtain a sufficient supply of this material in most localities.

The subject of core mixtures will not be complete without a consideration of the baking of cores. In the baking of an ordinary core two processes take place. First, the water used as a temporary bond is expelled as vapor, and, second, by the application of a higher heat the permanent bond is made effective. The natural or clay bonds are made effective by drying, for at the temperature of an ordinary core oven these bonds do not vitrify.

Such bonds as linseed oil, corn oil, resin, pitch, etc., become effective by first being made more fluid under the influence of heat so that they spread rapidly through the sand grains, and, second, by being partially oxidized or changed chemically so that as the core cools, it hardens.

This is particularly true in the case of linseed oil or corn oil. Where flour is used as a binder the hardening process is essentially the same as the making of bread; in other words, through the action of the heat and the expulsion of the moisture, the gluten in the flour is made effective.

WHY STEEL RAILS BREAK.

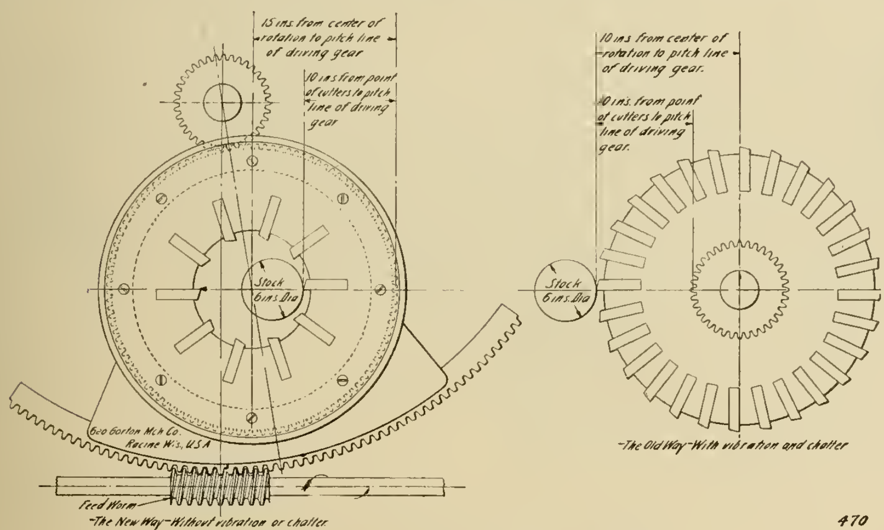
In a paper read by David B. Rushmore of Schenectady at the 94th meeting of the American Institute of Mining Engineers to-night the author explained that the Bessemer process for making steel rails could be used only with certain ores, the supply of which was now almost exhausted. Mr. Rushmore continued: "Accordingly we can lay the breakages and failures of steel rails reported in recent times to the use of the Bessemer process steel originally taken from other ores than those adapted to its use. The specifications for new steel rails accordingly require as a general rule, that the open hearth process be used."

DEVELOPMENTS IN MACHINERY

New Machinery for Machine Shop, Foundry, Pattern Shop, Planing Mill; New Engines, Boilers, Electrical Machinery, Transmission Devices.

GORTON PATENT CUTTING OFF MACHINE.

The tool as illustrated represents the results of four or five years in the designing, building and thorough testing out of several machines, embodying the principles illustrated and described below. The main features have been a pet hobby of Geo. Gorton for over twenty years, but it has only been possible to properly develop the tool since the advent of perfected high duty steels—for the reason that solid saw blades of the old type could be driven to the full capacity of the blade. Present high duty steels offered the opportunity to get much larger results in output, limited, however, by the present methods of driving such blades, and anyone who has endeavored to obtain high speed of feeds will admit, that the saw driving capacity of the best is lamentably weak. Excessive vibration and consequent chatter caused by the work having a leverage over the saw drive, establishes a limit beyond which it has seemed impossible to pass.



Sectional View of Cutting-off Machine.

Our latest machines overcome entirely this tendency to vibration and as a consequence a cutting feed or saw advance of three inches per minute is readily maintained on regular commercial open hearth steel bars of 4 inches diameter and over. When operating on 6 inch dia. O. H. steel at a saw advance of 4 inches per minute (severing the 6 inch bar in $1\frac{1}{2}$ minutes) not the slightest vibration is noticeable in any part of the machine, and this on the 6 inch machine as illustrated herewith, weighing 7,000 lbs.

Referring to the line drawing, it will be noticed our saw drive is six times as powerful as is possible on any ordinary design of cutting off saw. On the 6 inch machine now being built the drive is 9 times as powerful.

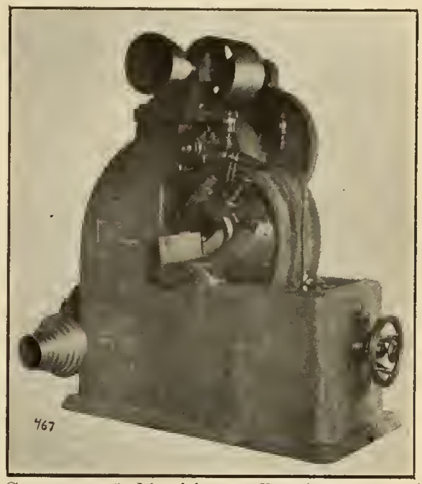
The feed mechanism gives a 2 to 1 leverage over the saw, further aiding very materially in its smooth running. The feed consists of a 90 degree segment of a worm gear operated with a good generous worm running in oil. This worm is mounted on a hollow shaft upon the forward end of which is the large hand wheel and at rear end a smaller worm gear connected with a friction clutch operated by means of push rod ending in the smaller wheel, shown at the centre of large hand wheel.

Six speeds are provided in geometrical progression, each of which on the 6 inch machine illustrated will sever a 6 inch bar as follows:

1.50 minutes.
1.75 minutes.
2.00 minutes.
2.25 minutes.
2.50 minutes.
3.00 minutes.
4.00 minutes.
5.30 minutes.

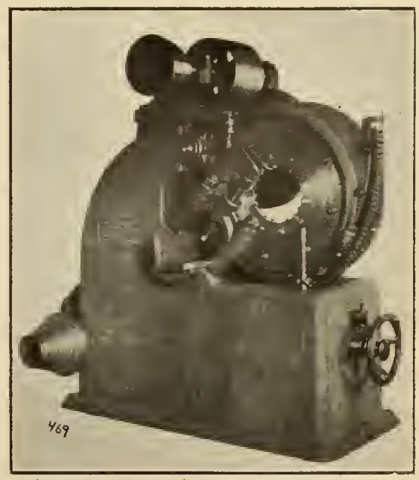
Saw teeth revolving at the rate of 75 feet per minute, thoroughly lubricated with a compound of water, lard oil, soda and soap.

Main driving pulley 14 inches diameter, 10 inch face, operating at 350 R. P. M. and consuming 18 H.P. when severing a 6 inch O.H. steel bar in $1\frac{1}{2}$ minutes. All gears are of generous pro-



Cutting-off Machine. (Ready to cut.)

portions, cut from the solid and main saw driving pinion is a steel forging integral with the shaft. All bearings are either run in oil, ring oiling, or provided with sight feed oilers, particular attention being given to lubrication throughout and all bearings are grit proof, all gears fully enclosed. The saw frame being hung on trunnions from above, avoids any possibility of grit



Cutting-off Machine. (Blade elevated.)

injuring this important detail of saw construction, as is evidenced by the badly cut ways so frequently seen on sawing machines in particular.

In a thorough study of several years, special effort has been made to produce a tool capable of hard service at

high efficiency that will be fool proof and capable of being operated by unskilled laborers. The base is a rugged one piece casting—heavily ribbed and webbed across the entire bottom forming a generous water pan. An opening is provided at rear side for removal of chips which settle and slide down a chip screen to an outside pan provided.

A geared water or saw lubricating pump is attached with all piping desirable. Stock supports are furnished provided with rollers to enable the easy insertion and adjustment of heavy bar stock against an adjustable gauge when desired, which gauge may be swung over when not required.

A few points of advantage are :.

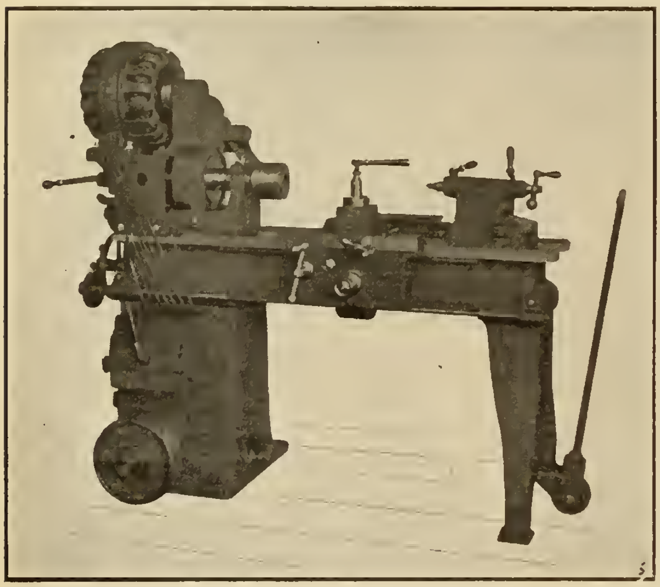
Drive four to six times as powerful as on any other machines of similar sizes; throwing in power feed; all gears cut from solid; all bearings perfectly lubricated and machine dust and grit proof; net weight complete as per photo, 7,000 lbs., can be furnished belt driven or direct connected electrically driven; other sizes in process, 4 inch, 9 inch, 12½ inch, weighing from 5,000 to 25,000 lbs.; These machines are protected by several U. S. patents and others applied for, also by foreign patents; each machine is provided with three stock supports containing a roller, in order that heavy stock may be lifted onto the supports with a crane and readily rolled through the machine, thus easily obtaining the requisite adjustment for cutting off any desired length.

This machine is made by George Gorton Machine Co., Racine, Wis.

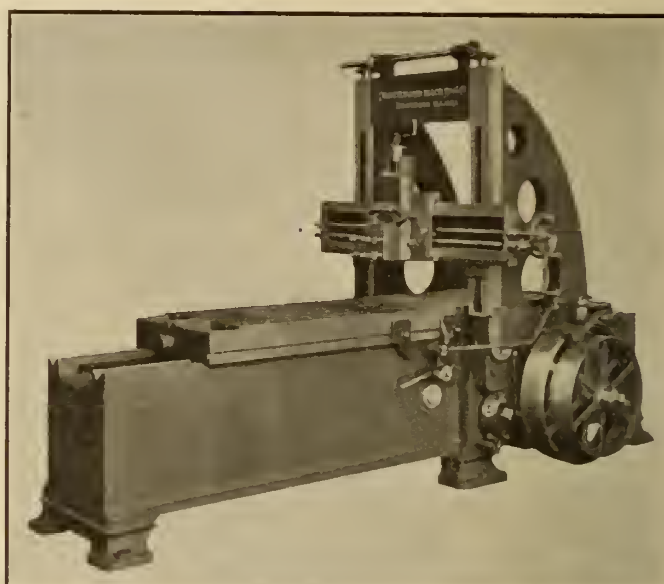
connected with the lathe spindle, so as to drive the latter at either 200 or 400 rev. per min. When desired, the machine is equipped with a direct current motor, and one of variable speed form may be selected to give a wider range of speeds for the spindle.

There are located about the shop at convenient intervals plug receptacles for connecting the motor through flexible cables to the electric current supply, and a simple and convenient plug is attached to the cable for that purpose.

The particular utility of this machine is that it enables the turning of each individual bolt to the exact size required in the place it is to be used, and saves the time which is ordinarily lost in making trips to and from the machine shop to get exactly what is wanted.



Portable Motor-Driven Lathe.



Heavy Planer.

feed twice as powerful as on any other, having a leverage of 2 to 1; saw blade being supported around entire periphery cannot buckle or "snake;" inserted teeth being on inside of blade are more rigidly supported and have no tendency to work out; absolutely no vibration or chatter, consequently high saw speed and saw feed may be obtained; dust and grit proof throughout.

The specifications of the 6 inch machine are as follows :

Driving pulley, 14 inches diameter, 10 inch face, running 350 R.P.M.; power required for maximum output, 18 H.P.; floor flange on base 67 inches long, 33 inches wide; length of machine over all 84 inches; width of machine over all 56 inches; height of machine over all 78 inches; saw frame may be quickly raised by means of feed wheel for easy access to cutters; capacity, 6 inch round or square with automatic feed release; 8 inch round by means of back feeding 2 inches by hand, and then

PORTABLE MOTOR-DRIVEN LATHE.

Accompanying is an illustration of a simple, portable motor-driven, direct-connected, bolt-cutting lathe for locomotive repair shops, made by Williams & Wilson Co., Montreal, and equipped with Westinghouse motor.

Two ways of transporting are possible. For short distances it may be rolled on the wheels upon which it is mounted, or it can be lifted by a crane and placed beside an erecting pit and then shifted to the exact position desired by hand. When in working position the single wheel at the tail end is deflected by lifting the tongue handle so as to allow the two rear legs to rest on the floor. The weight of the lathe is then sufficient to keep it from moving unintentionally during its operation.

An alternating current induction motor is applied on the machine illustrated and is of 2 h.p. size, intended to run at 1,700 revolutions per minute. Through a friction clutch and change gears it is

ed. At the same time the mechanic is allowed to carry on his work without interruption. When not in use the machine can be moved to some point in the shop where it will be out of the way of the workmen, and at such times it may be used as a convenient auxiliary to the regular machine shop equipment.

HEAVY LINE OF PLANERS.

The 24-in.x24-in.x6-ft. planer illustrated is the first of the line of heavy pattern planers being brought out by the Rockford Machine Tool Company, Rockford, Illinois, which they will build in connection with their line of crank shapers. This machine weighs 7,100 lbs., and at a cutting speed of thirty feet per minute, the return of the platen is ninety feet per minute. All gears in the drive are inside the bed, between the bearings, which protects them perfectly against accidents, and from falling chips and grit.

The power is transmitted through twin gears consisting of two pinions on the pulley shaft, and two intermediate

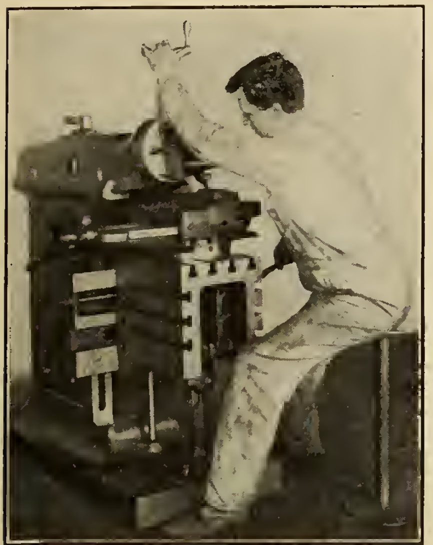


Fig. 1—New Cross Feed for Shapers.

gears working simultaneously, one on each side of the master gear. This method makes the drive very simple, and doubles the bearing surfaces on the most rapid gears and pinions. This feature also insures long life and gives great power to the machine. All bearings in the bed are bored and bushed, and all bearings are fitted with a very efficient self-oiling feature. The feed friction is of the double releasing type, which will not heat when operating rapidly and gives a powerful feed to the tool when taking heavy cuts. The feed range is from .016 feet to .750 ins.

NEW FRONT CROSS FEED FOR SHAPER.

The accompanying comparative illustrations graphically illustrate the ad-

Fig. 2—New Cross Feed for Shapers.

vantageous features of merit of the new front cross feed which Messrs. Gould & Eberhardt, Newark, N.J., are putting on the market as an attachment to their well-known line of "High Duty" Shapers. This new front cross feed is intended principally for tool room and die work, where the job requires both down and cross feeds to follow a given outline.

Figs. 1 and 2 show the contortions necessary with the standard shaper, in order to use both feeds and keep an eye on the line. The new front cross feed which the manufacturers have designated as "The Natural Way," is shown in Fig. 3. It is claimed that this feed will not only enable the workman to turn out better and more accurate work, but it also permits of a less fatiguing position at the machine. This addition to the already long list of shaper improvements put out by Gould & Eberhardt, is patented and controlled by them.

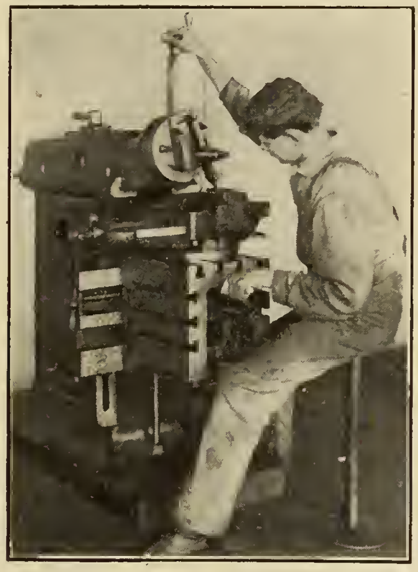


Fig. 3—"The Natural Way," New Cross Feed for Shapers.

NEW ELECTRIC HOIST.

The illustrations show a number of different applications of the new Shepard electric hoist recently put on the market by the General Pneumatic Tool Company, Montour Falls, N.Y. As will be seen in Fig. 1, the general design is very compact, embodying the motor at one end in direct line with the hoisting mechanism and the rope drum, while at the back is a controller of ample size and with an unusual number of resistance steps so as to afford the most delicate control. This also greatly increases the life of the motor, which is seriously affected by throwing on the full voltage, as is sometimes done.

The compact design allows a very substantial construction in every way, so as to withstand the rough usage due to unskilled labor, and should greatly reduce the repair bills.

A feature of these cranes is that the parts of these hoists are made interchangeable with similar parts of their

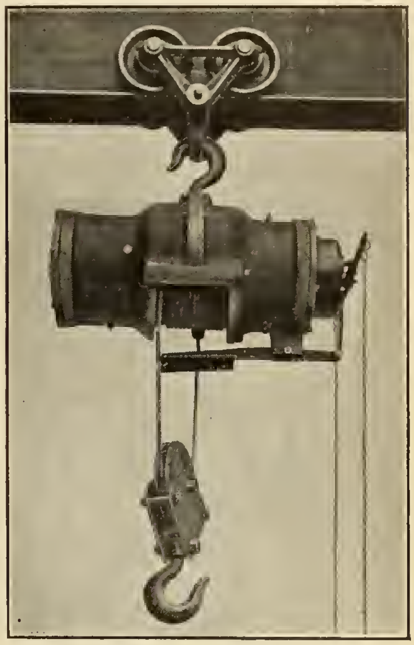


Fig. 1—New Electric Hoist.

standard cranes, so that a minimum supply of duplicate parts will insure constant operation at all times.

Careful attention has been paid toward making these hoists accessible, and as a result each important group of parts is easy to get at without interfering with any other portion. Should it become necessary to remove the armature of the motor, no part of the electric wiring need be disconnected, except the armature leads, and no part of the hoisting mechanism needs to be removed except the front housing of the

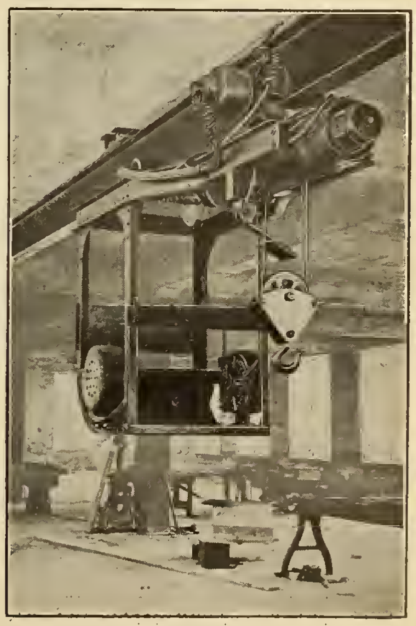


Fig. 2—New Electric Hoist.

motor itself. A similar provision is made for convenient access to all the

important parts, both for removal and replacement. None of these operations requires special wrenches or tools of any kind.

Another feature is that no provision is made for adjustment, which does away with all tampering, and the hoists are designed with a sufficient margin of safety so that any natural wear will have no effect on their operation. The lubrication has been provided for with the same care, and all that needs to be done is to fill the three oil reservoirs, which are in conspicuous places, before they become empty. These hold oil enough for a long period.

Fig. 2 shows one of these hoists equipped with a cage, and travels under the control of an operator in the same way as the traveling crane.

CLARK AUTOMATIC NUT LOCK.

A new nut lock has been placed on the market, and is finding favor among manufacturers. It works automatically on the principle of a ratchet, and is made to fit all standard sizes of bolts and nuts, from 1/4 inch upwards.

Fig. 1, shows the Clark automatic nut lock, locked to the bolt, the nut having been screwed on and removed. It is a positive lock. The nut can be tightened up as often as required to take up looseness from wear or shrinkage. Fig. 2, shows the nut lock locking a nut, and it shows that the outer prongs which hold the nut from backward movement are not compressed and retain their position up against the nut.

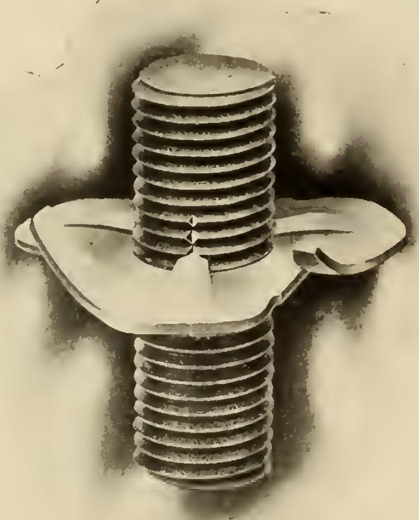


Fig. 1—Clark Nut-Lock, Nut Having Been Screwed on and Removed.

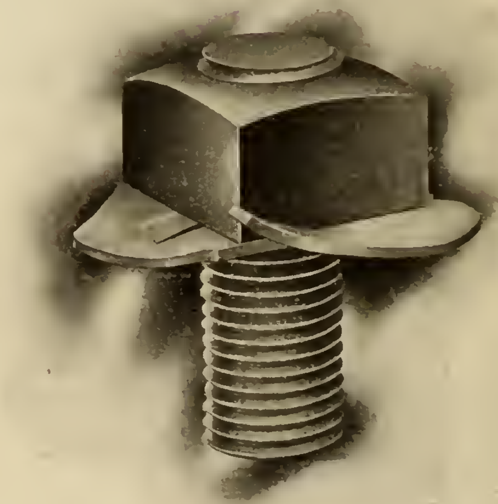


Fig. 2—Clark Nut-Lock, Locking the Nut

The lock is made of spring steel and is oil tempered, and is practical for all purposes, including railway and street car trucks, on cars, locomotives, bridges, frogs and switches, electric motors, automobiles, truss rods, brake beams, agricultural implements and on all machinery subject to vibration. The Railroad Commission has ordered 70,000 for the Transcontinental Railway, and these are now in use on the Winnipeg division.

The nut lock slips on the bolt the same as a common washer, with the prongs pointing outward towards the nut. The nut in being screwed down on the bolt compresses the three inner prongs, the points of which cut through the thread of the bolt to about one-half the depth of the thread, thereby fastening the lock to the bolt. Fig. 1, shows the position of the prongs with nut removed.

The nut passes over and compresses the three outer prongs which spring back into position up against the sides of the nut, shown in Fig. 2, as the corners of the nut pass by, thereby preventing any backward movement of the nut. The compression of the three inner prongs form a strong cushion spring to take up the looseness from wear or shrinkage of the abutting surfaces, occurring during the first few months the bolts and nuts are applied, until the looseness is taken up by tightening the nuts.

The thread on the bolt is not injured and the lock is taken off by turning the nut backwards. This breaks the nut lock from the bolt and it falls off. When a nut is removed a new lock is necessary, but the cost is small. A company with a capital of $300,000 is about to be formed in the United States to manufacture these locks. They are already being manufactured in Montreal, and Dinning & Eckenstein, 205 St. James Street, Montreal, are the sole selling agents for Canada and Newfoundland. Patents have been procured in all countries, but we understand that Dinning & Eckenstein have not arranged for the manufacture of these lock nuts outside of Canada and the United States as yet.

NEW LINE OF GRINDERS.

The accompanying illustrations are two of a line of grinders made by John H. Hall & Sons, makers of special machinery, Brantford. The No. 1 single wheel bench grinder takes an 8-in. wheel; the bearings are long; the rest is very simple and easily adjusted.

No. 2 is a double wheel bench grinder ; has two-speed cone ; and will take a 10-in. wheel.

No. 3 is a double end pedestal grind-

Hall Bench Grinder.

er with a spindle 29 inches long, and takes a wheel 14 inches in diameter. The pedestal and frame are very neat in design, while the bearings are dust-proof; it has a two-speed cone, the head and pedestal are made in two pieces, carefully faced off and firmly bolted together.

Hale Pedestal Grinder.

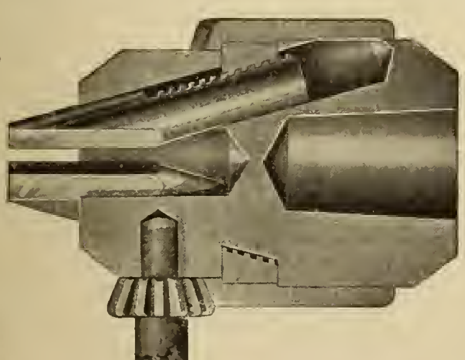
THE JACOBS DRILL CHUCK.

The accompanying illustrations show the construction and outside appearance of the Jacobs improved drill chuck. This chuck is another example of the axiom, "necessity is the mother of invention." Five or six years ago the inventor of the Jacobs chuck could not find a drill chuck that would do its work in a satisfactory manner. The two-jawed chucks on the market, although they had a convenient key-locking device, were undesirable in shape, would not keep true, were slow to adjust, and lacked sufficient gripping power. The three-jawed chuck was well shaped, well constructed, would keep remarkably true, a large range of adjustments could be easily and quickly made ; but it lacked a convenient device for securely locking.

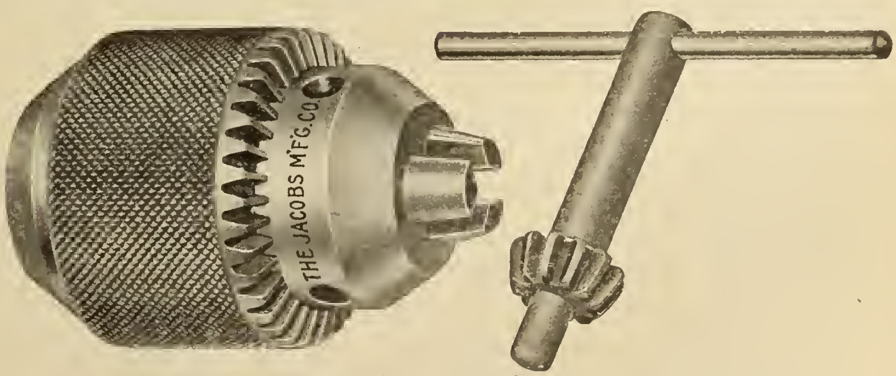
This type of three-jawed chuck is adjusted by revolving the sleeve upon the body. To securely lock the chuck, it was necessary to use a spanner to force the sleeve to revolve. This action was inclined to revolve the whole chuck and the spindle as well. To off-set this tendency, the operator grasped the belt with one hand, thus injuring the belt, while with the other, he applied force to the spanner, which frequently twisted the chuck off the shank, or the shank out of the spindle. If all worked well, he would succeed in adjusting the chuck, but as both hands were occupied in the adjustment, the drill would often fall to the floor.

The inventor of the Jacobs chuck overcame these serious deficiencies by applying the key-locking principle to the best type of three-jawed chuck. This was accomplished by cutting gear teeth upon the edge of the sleeve, and drilling holes in the chuck body, into which a toothed key may be inserted. By the insertion of the toothed key into one of these holes, and revolving the key, great force may be applied to revolve the sleeve. As the axis of the key is at right angles to that of the spindle, the force applied to revolve the key is not inclined to revolve the spindle.

This chuck is made in five sizes, and is manufactured by the Jacobs Mfg. Co., Hartford, Conn.



Jacobs' Drill Chuck.

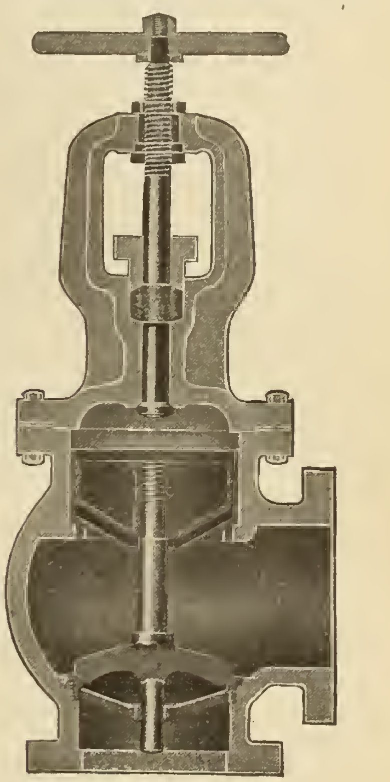


Jacobs' Drill Chuck.

ANDERSON CUSHIONED NON-RETURN VALVES.

These valves when placed between the boiler and header will equalize the pressure between the different units of a battery of boilers, as they remain closed as long as the boiler pressure is lower than that of the header. When the boiler pressure equals that of the header pressure, they will open and remain in that position without chattering or hammering. They will automatically cut off a boiler in case of accident to that boiler, such as the bursting or collapsing of a tube, and will also act as a safety stop to prevent steam from being turned into a cold boiler, which also means a safeguard for men when working inside. Boiler attendants are many times deceived by inaccurate steam gauges, and are liable to turn on steam and connect the boiler when there is a considerable difference in pressure. Many accidents have resulted from this cause.

In the accompanying illustration it will be seen that the dash-pot occupies



Cushioned Non-return Valves.

the full area of the body, thus insuring perfect cushioning, thus doing away with chattering. The absence of bolts, screws, hinged joints, etc. The inside bronze dash-pot is firmly attached to the spindle, while the outside dash-pot is loose on the spindle.

These valves are made by the Golden-Anderson Valve Specialty Co., Pittsburg, Pa.

TECHNICAL LECTURERS.

The Royal Arcanum, Inglis Building, Montreal, has recognized the importance of technical lectures, and on Feb. 24 were addressed by Chas. B. Hazen, B.Sc., on Exact Science in Modern Commerce. On March 23, Mr. W. Scott Hutchinson, B.Sc., will give a lecture on Thermite, with practical demonstrations.

CANADIAN MACHINERY
and Manufacturing News

A monthly newspaper devoted to machinery and manufacturing interests, mechanical and electrical trades, the foundry, technical progress, construction and improvement, and to all users of power developed from steam, gas, electricity, compressed air and water in Canada.

The MacLean Publishing Company, Limited

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H. V. TYRRELL - - - Business Manager
J. C. ARMER, B.A.Sc., - Managing Editor
G. C. KEITH, B.Sc., - - Associate Editor

OFFICES:

CANADA
MONTREAL - 232 McGill Street, Phone Main 1255
TORONTO - 10 Front Street East, Phone Main 2701
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SUBSCRIPTION RATE.

Canada, United States, $1.00 Great Britain, Australia and other colonies 4s. 6d., per year; other countries, $1.50. Advertising rates on request.

Subscribers who are not receiving their paper regularly will confer a favor on us by letting us know. We should be notified at once of any change in address, giving both old and new.

Vol. IV. MARCH, 1908 No. 3.

CONTENTS

MONTREAL TRADE BULLETIN.

The industry during the month of February showed an improvement over December. As December was unusual however, it is hardly fair to compare trade reports with that month. The months of January and February in 1907 were really records, for the first two months of the year, and while trade in some lines, such as the foundry supply and fire brick trade is as good as these months last year, yet in other lines, such as iron and steel and small tool supplies and perhaps tool steel, it is not quite up to January and February of 1907. Business is improving, however, and is better than these months 1906. Business men anticipate that with April we will have renewed activity. Some dealers report large orders of small tools having been booked, and a large demand in this line is anticipated with the renewed activities that are already showing around manufacturing districts.

Some of the larger factories are running short time or with fewer men than last year. There are several reasons for this. Some large corporations have placed contracts in the U. S. that should have kept these plants running with a full quota of men all winter. Other plants, such as the G.T.R. shops are expected to be busier in a very short time and even busier than in 1907. Large shops will be necessary to handle the work from the G.T.P., and the enlargement of the shops at Battle Creek and Stratford will be followed by the enlargement of the shops in Montreal.

Everything appears to indicate a very much better spring trade than expected, and in most lines manufacturers are confident of a steadily increasing trade throughout the year. Many small shops are working to the limit and some are planning extensions in the near future.

The demand for railroad supplies is fair for this time of the year. There is a steady demand for hammers, picks, rock drills, drill steel, rails, ties, track bolts, etc., and with the commencement of construction operations, more than an average trade will be done. With the giving out of contracts for 366 miles of the G.T.P. in New Brunswick and Ontario the outlook for the railway supply trade is good.

Business is being done in bolts and nuts for bridge and iron work construction, but sales so far are behind 1907, though prospects look favorable for a good spring demand.

The machine tool trade is good, and selling agents have recorded some large sales. Orders are plentiful and collections show a slight improvement, although they are still slow. Wood-working machinery is in demand, and the electric industries, both wire cable and machinery, appear to be busier than at the beginning of the year. Mining machinery orders are coming in and it points toward a good spring trade in this line. Trade, taking everything into consideration, compares favorably with January and February, 1907.

The demand in the old country for pig iron is improving, and consequently the market is holding firm. Stocks are light and as heavy consumers will be coming into the market shortly, everything is favorable to a strengthening tone being given to conditions generally. In the U. S. conditions are uncertain. There has been considerable cutting for prompt shipment and consequently the market is not quite so firm as it would otherwise be.

The directors of the N. S. Steel Co. met at the Windsor here last week to consider the industrial situation. They are well satisfied that signs of a revival of trade are unmistakable, and have, indeed, already begun to make themselves felt in large orders coming in to the new works at New Glasgow.

ONTARIO TRADE BULLETIN.

Undoubtedly trade conditions throughout Ontario are gradually improving, although many plants are still running short hours. Manufacturers are very hopeful for a considerable brightening in trade early in the spring, and taking that view, some manufacturers claim that it is poor policy to cut down the working hours if it can possibly be avoided. Especially is this true of makers of

agricultural machinery and farmers' tools. One manufacturer of this line, interviewed by Canadian Machinery, said that when spring opened up well there would be a big demand for this class of machinery, and the manufacturers who have a stock on hand will be well off, whereas those who have been running short hours and who have not been doing any stocking, will find themselves unable to satisfy the demand without working overtime, and, perhaps, adding to their equipment.

If the spring opens up well and the farmers start buying the machinery they will need, it will be the means of starting the ball rolling again, since once free buying is started in any line, it will soon spread throughout the whole industrial field.

TECHNICAL LITERATURE SHOULD NOT BE DEBARRED.

At a result of the postage on daily papers being reduced to the rate holding previous to the postal agreement made a year ago, between Canada and the United States, the question of scientific and technical papers again comes up. Just now manufacturers and educationalists in Canada are discussing the need of technical education at considerable length, and the Dominion Government has been petitioned to take up the matter. But on the head of this scientific and technical papers from the United States are required to raise their subscription rate to Canadian readers because of the increase of postage, thus hindering Canadian engineers and mechanics from getting technical knowledge at a minimum rate. Surely the importance of technical literature in producing good engineers and good mechanics cannot be realized by the postal authorities. There are a few American engineering and mechanical papers which are not equalled the world over. It is a serious hindrance to the cause of technical education to shut these papers out of Canada.

At present Canadian engineering and mechanical papers cannot afford to obtain and publish the great amount of high class matter used in these few American papers referred to, and in some cases there is nothing whatever in Canada to take their place. But during the last three or four years, the lead of Canadian Machinery has been followed in the establishment of specialized papers, and as the country enlarges and develops these specialized papers will be able to publish more and more high class material, as their revenues increase. It would surprise a good many to know how editorial expenses on Canadian Machinery swallows up revenue.

But this fact is clear: Canadian engineers, civil, mechanical and electrical, and Canadian mechanics need all the technical information they can get, and they should be given every chance by the Canadian Government to secure this technical information at the lowest possible rate.

A reader discussing the question recently pointed out that the policy of the Government was re-acting against the mechanic, the man who cannot afford to pay any more than necessary for his technical literature. The comparatively well-to-do engineer and university graduate also suffered, but not to the degree that the mechanic does.

REGARDING IRON AND STEEL BOUNTIES.

It was stated at a large meeting of farmers recently, that the bounties paid to iron and steel manufacturers in Canada is sufficient to pay the wages of the employes engaged in the business. This statement is untrue. Taking a single instance as an example, the bounties received are not one-quarter of the amount paid out in wages directly; and there is, in addition, the wages of miners of ore and coal, and of those employed in the shipping, etc., which are included indirectly. Last session Hon. Mr. Fielding, when dealing with the question of bounties, stated that on a ton of iron, the combined bounty and duty on iron and steel was a lower percentage of protection than the farmer had on his product, and it is claimed by some of the iron and steel manufacturers, that it is lower than upon any article made in Canada into the manufacture of which iron enters.

SOMETHING ABOUT OURSELVES.

We take a pardonable pride in the development shown in Canadian Machinery in the last year. No doubt our readers find the information more interesting and valuable.

* * *

This development has not taken place without considerable effort on our part. Things do not happen of themselves. The increased value of the paper is directly due to increased effort on our part.

* * *

Readers have probably noticed the change in the headings, there being a very decided improvement. This leads us to tell of a practice adopted by the MacLean Publishing Company, which has been characterized as useless extravagance by some, but which we regard as necessary to the maintaining of a high standard of printing in advertising and editorial papers. This practice is to make a complete change in type every three years. That is, during a three year period type is gradually scrapped, making room for new type, until at the end of the period, there is a complete set of new type. This policy allows us to keep completely up-to-date as far as type is concerned.

* * *

Since a year ago our expenses for editorial in the way of special contributions, illustrating, traveling expenses and salaries have practically been doubled. Contributed articles appearing during the past few months have been by men who are highest up in the line along which the article is written. Our writers have been experts, whose statements can be relied upon, and whose opinions carry considerable weight.

* * *

For our advertisers we are equally zealous. Our subscription campaign during the last year has been an exceptionally efficient one. The whole Dominion has been covered effectively, Ontario, Quebec, and the Maritime Provinces twice and three times. The men who influence buying have been followed up with good results, railroad men in particular.

* * *

Every effort is being made to make Canadian Machinery a very strong and valuable mechanical paper, and from what our friends throughout the country say, we are having very fair success.

* * *

Canadian Machinery is a paper devoted to educational matter of a technical nature, aiming to help along manufacturing on a sound basis. It deserves the hearty support of all Canadians interested in propagating the cause of technical education.

NEWS OF THE SOCIETIES

CIVIL ENGINEERS' ANNUAL CONVENTION.

The twenty-second annual convention of the Canadian Society of Civil Engineers was held in Montreal on Jan. 28, 29 and 30. Officers for the coming year were elected as follows:

President—John Galbraith, Dean of Faculty of Applied Science, Toronto.

Vice-Presidents—W. F. Tye, Montreal; H. H. McLeod, Winnipeg; and C. H. Duggan, Sydney.

Members to the Council were elected as follows: F. F. Busteed, Vancouver; N. J. Ker, Ottawa; R. W. Leonard, St. Catharines; C. H. Mitchell, Toronto; J. E. Switzer, Winnipeg; R. McColl, Halifax; A. A. Dion, Ottawa; A. E. Doucet, Quebec; W. R. Butler, Kingston; F. P. Gutelius, Montreal; Henry Holgate, Montreal; R. S. Kelsh, Montreal; R. J. Durley, Montreal; C. M. Odell, Glace Bay; W. H. Breithaupt, Berlin, Ont.; J. B. Porter, Montreal; J. G. G. Kerry, Toronto; D. W. Robb, Amherst, N.S.; H. K. Wicksteed, Montreal, and W. J. Kennedy, jr., Montreal.

ENGINEERS' CLUB ANNUAL BANQUET.

A highly enjoyable evening was spent at the annual banquet of the Engineers' Club, held on Feb. 6, in the club rooms on King Street, Toronto. About 70 members and guests were in attendance.

Mr. C. B. Smith, past president, occupied the chair, and had the able assistance of President J. G. Sing. Dr. Ellis responded to the toast of "Our Country," and Mr. R. C. Steele, ex-president of the Board of Trade, performed a similar service on behalf of "Our City." Sister societies were well represented, and brief speeches were made by Mr. T. C. Irving, for the Canadian Society of Civil Engineers; Dr. Stupart, for the Canadian Institute; Mr. W. A. Bucke, for the Institute of Electrical Engineers; Mr. J. B. Tyrrell, for the Society of Mining Engineers; Mr. J. H. Hogg, for the Engineering Society of the University of Toronto; Prof. Rosebrugh, for the Faculty of Applied Science; and Capt. Gamble and Major Van Nostrand, for the Ontario Land Surveyors.

CENTRAL RAILWAY AND ENGINEERING CLUB.

The regular monthly meeting of the Central Railway and Engineering Club of Canada, was held on Feb. 18 at the Rossin House, Toronto, at which a paper on "Oils and Lubrication" was given by J. W. Bain, B.A., Sc., lecturer in Chemistry in Faculty of Applied Science, University of Toronto. The subject was considered from a chemical standpoint; and while being very interesting to the members, did not provoke much discussion.

PERSONAL MENTION.

J. C. Royce, S.B., consulting engineer, Toronto, is making a test of the new London Railway power plant.

* * *

Mr. Walter J. Francis, C.E., has opened offices as a consulting engineer in the Sovereign Bank Building, Montreal.

* * *

Mr. Royland Yeates, London Machine Tool Co., Hamilton, is in Montreal, opening up a sales department for the company in that city.

* * *

H. R. Charlton, advertising agent of the G.T.R., is spending six weeks in England and the Continent on business connected with the development of the G.T.R. and G.T.P.

* * *

Charles Ericson, inspector of steel for the Hamilton Steel & Iron Company, was married recently to Miss Grace Presnail, daughter of William P. Presnail, of the Tuckett Cigar Company.

* * *

Mr. J. A. Coulter, president and manager of the John Morrow Machine Screw Co., Ingersoll, Ont., was presented recently with a handsome clock by the employes in appreciation of the kind consideration with which he had always treated his employes.

* * *

Mr. C. Drinkwater has been appointed senior assistant to the president of the C.P.R. Mr. Drinkwater will have charge of all matters affecting the company in connection with legislation at Toronto, Quebec and Ottawa, and the business of the company with the Railway Commission.

* * *

Orrin S. Werntz, treasurer of the National Acme Mfg. Co., Cleveland, O., died Feb. 6, at the age of 32. Mr. Werntz was born in Canal Fulton, O., and removed to Cleveland early in life. His first position was with the National Screw and Tack Co., until the organization of the National Acme Mfg. Co., when he became treasurer.

* * *

Charles H. Cahan, counsel for the Mexican Light, Heat & Power Company has been visiting in Montreal and Halifax promoting the interest of trade between Mexico and Canada; and he said there was every prospect of Canada securing a good share of this lucrative business. Where travelers can speak either Spanish or French and will study the trade situation, Mexicans will be found quite ready to extend the hand of friendship to the manufacturers of the Dominion.

* * *

George A. Gauthier, formerly chief draftsman and designer of the Universal Screw Machine Co., Hartford, Conn., has taken a position in Toronto, Canada, to design machinery for the Caldwell double-thread wood screw, which is being developed by Worth & Martin of that city.

* * *

A. H. Phoenix, superintendent of the Hamilton Bridge Works, has left on an extended trip abroad. He will devote his time entirely to pleasure and sightseeing, and will visit France in addition to the British Isles. On the eve of his departure, the foremen at the bridge works presented him with a very elaborate suit case.

* * *

J. F. Gaffney, manager of the Toronto branch of the Dominion Foundry Supply Co., during the last two years, has resigned to accept the position of superintendent of the John McDougall Caledonian Iron Works Co., Montreal, Canada. Mr. Gaffney was formerly foundry superintendent of the Allis-Chalmers-Bullock Co.

* * *

Mr. A. A. Bowman, Toronto manager of the Canadian Rand Company, passed through Montreal, recently, on his way to the Maritime Provinces, on a trip of inspection for the company, after having spent several weeks on a similar errand, in Manitoba and the Northwest. While in the West he visited the principal mining and manufacturing centres and found the outlook for business for the company quite promising. This is attested in the fact that the company has since decided to open an office at 406 Traveler's Building, Winnipeg, where will be kept a full line of Rand mining machinery for the benefit of purchasers in the West.

* * *

J. K. Bougher, president of J. W. Paxson Co., foundry supplies and equipment, Philadelphia, and several other companies, is dead. Mr. Bougher was a self-made man; serving in the Union Army during the Rebellion, his early days being spent as a tugboat captain on the Delaware River and tributaries. While still a young man he made the acquaintance of John W. Paxson, and together they formed the J. W. Paxson Co., miners and shippers of foundry sand. They afterwards built facing mills, machine, boiler and blacksmith shops, as well as factory for making all kinds of wire and bristle brushes, sieves, etc., for foundry use.

INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News.

Machine Shop and Foundry News.

The London Machine Tool Co., Hamilton, will open a sales office in Montreal.

A malleable iron foundry, capitalized at $100,000 is seeking a location at Arnprior, Ont.

The new foundry of the Sheriff Manufacturing Co., Brockville, Ont., recently commenced operations.

Rhodes, Currie & Co., Amherst, N.S., may operate the Intercolonial Railway machine shops at Moncton, N.B.

A proposition is before the council, Renfrew, Ont., for the establishment of a foundry and machine shop in that place.

J. de Clercy, M.E., has installed Baillot cupolas in the Standard Foundry, Longueil, Que., and Fonderie Canadienne, Montreal.

The Rapid Tool Company, Peterboro, has suffered a severe loss by fire. The blacksmith shop was gutted and several other buildings damaged.

Electric Power and Transmission.

The town clerk, Tillsonburg, Ont., wants figures from contractors and others on the cost of an electric light plant, which the council are contemplating installing.

The Winnipeg Electric Street Railway is making preparation for the electrical operation of the line to Selkirk. It is expected that this line will be completed by March.

The contract for the erection of the new power house for Campbellford, Ont., in connection with the Middle Falls power project, has been let to Bogue & Buchanan, of Peterboro. The dam is to be constructed by Brown & Aylmer.

The Federal authorities have definitely decided to install an extensive gas plant for the exclusive use of the Dominion arsenal, Artillery park, Quebec. The estimated outlay is $50,000, and plans of the new construction are being prepared.

The Standard Construction Co., Montreal, are installing a very modern 500 h.p. electric plant in the La Presse building. The generators will be in three units, two of 150 kwt., and one of 175 kwt. A six-panel switchboard will distribute the current to the power and lighting mains.

There is a probability that the street lighting system of Peterboro, Ont., will be changed from the present system of open arc lamps to the enclosed arc lamp system. The latter is recommended by the Peterboro Light & Power Company, which has the contract for lighting the city.

Dr. J. W. Spencer, the British scientist, commissioned to report on the effect on Niagara Falls if the Ontario Power Co. were granted its franchise, states that the falls would be deprived of from 20 to 25 per cent of their volume, and the level of Lake Erie would be lowered by three feet.

The Georgian Bay Power Company will build a dam and power house at Eugenia, Ont., this season in connection with the water power development for transmission to Owen Sound. A quantity of fifty-four-inch steel pipe will be required in the undertaking. H. Von Schon, of Detroit, Mich., is the consulting engineer.

Saw and Planing Mills.

The large sawmill in course of construction at Bathurst, N.B., owned by the Louison Lumber Co., at Jacquet River Bridge, was totally destroyed by fire. All the modern machinery was also destroyed, entailing a loss of thirty thousand dollars. Saw and rossing mills will be rebuilt at a cost of $110,000.

Railway and Marine News.

The Hudson Bay Co. will construct two new steamers for service on the Skeena river, B.C.

The Reid-Newfoundland Co., Newfoundland, have ordered two locomotives for their lines.

The C.P.R. hope to have the line from Toronto to Sudbury, Ont., completed by next June.

The Kingston Shipping Co., Kingston, has built a large freight steamer for use on the lakes.

The G.T.R. has just floated a loan of $5,000,000 to provide rolling stock for the equipment of the railway.

The work of building a new union station at Winnipeg will be started early in the spring and pushed to completion.

Beyer-Peacock Co., an English locomotive firm, is considering the establishment of a plant near Montreal.

The Toronto Railway Co. recently shipped six open trolley cars for use on the lines of the Mexico Electric Co., Monterey, Mexico.

Tenders will be received till March 10 by the Transcontinental Railway Commission for the construction of 422 miles of Transcontinental Railway.

It is estimated that the hundred miles of road which the G.T.P. will construct east of Prince Rupert, B.C., will cost in the neighborhood of $7,000,000.

Large deposits of iron ore of the hematite variety have been discovered near Port Arthur, Ont. Assays show the deposits to be from 50 to 67 per cent. iron. The new discoveries are extensive and are near the line of the G.T.P.

The Dominion Iron & Steel Company, Montreal, has been awarded the contract by the Canadian Pacific Railway for thirty thousand tons of steel rails to be delivered during the coming season. Smaller contracts with one or two other concerns are also reported.

The surveys for the West Shore Electric Railway will be commenced shortly from Kincardine, Ont. Construction is expected to start in May. The ratepayers of Goderich, Ont., have approved a by-law to guarantee $150,000 of the bonds of the Ontario and West Shore Electric Railway.

At a recent meeting of the Board of Trade, Montreal, a petition was prepared to be sent to the Federal Government, asking that the Quebec bridge be at least 190 feet above the high-water mark of the St. Lawrence. It is claimed that owing to the rapid growth in size of ocean-going vessels this was a necessity.

Structural Steel Construction.

Plans have been prepared by Messrs. Dalton and Everleigh for a $50,000 sanitorium to be erected near Kamloops, B.C.

It is anticipated that City Engineer Rust, Toronto, will be instructed to prepare plans for a street railway bridge over the western gap at Queen's wharf, at a probable cost of $60,000.

Tenders will be received until February the 24th, 1908, for the construction of a re-inforced concrete bridge and dam on the Wascana creek, Regina, Sask. F. J. Robinson, deputy commissioner, Regina.

Waterworks and Sewage.

The waterworks system, Palmerston, Ont., will be extended at a cost of $85,000.

A by-law was passed at East Toronto for $10,000 for waterworks repairs.

It is proposed to issue debentures for $50,000 for the extension of the water mains, Ottawa.

In his report upon the cost of the necessary improvements to the water system, the city engineer, Fernie, B.C., recommends extensions to cost $44,600.

A project is being formed at Portage la Prairie, with a view to supplying the railways with water. The scheme involves the laying of a pipe line to the river and the installation of a separate system at a cost of some $30,000.

Weyburn, Sask., is installing a municipal water supply system. A large supply of splendid water will be brought from an impounding reservoir to a standpipe in the town, from where it will be distributed by gravity. Willis Chapman, of Toronto, is engineer.

Municipal Undertakings.

Brockville, Ont., will install gas purifiers in the gas works, at a cost of $9,520.

Plans are being prepared for the construction of a 1,000,000-gallon reservoir at Trout Lake, Ont.

Tenders are being called by the Department of Railways and Canals, Ottawa, for timber for the Rideau canal.

The town council, Deseronto, Ont., has decided to install a gas producer plant in the pumping station.

The council of Outremont, Que., intends carrying on improvements during the coming year to cost $150,000.

The Dominion Government will spend about $100,000 on a new post office and custom house at Saskatoon, Sask.

The ratepayers of Berlin, Ont., have approved a by-law to raise $30,000 to extend the street railway system and electric light plant.

A report is current that a permanent post office and customs house will be built at Grand Forks, B.C., this season at a cost of $35,000.

Negotiations are stated to be in progress with the Winnipeg Safe Works, with a view to the establishment of a factory at Port Arthur, Ont.

London, Ont., will purchase a paving plant for use on the streets of that city. With a $500 equipment the city saved $3,500 on repairs to the roads last year.

The town council of Listowel, Ont., is considering the question of installing a producer gas plant and electrical equipment for the lighting of the town.

Negotiations are being conducted by the Guelph, Ont., city council with Harry Johnston, of Phelpston, with a view to the establishment of a brick factory in this city.

Peterboro, Ont., has applied to the Legislature for confirmation of its authority to loan the William Hamilton Co., $35,000. With this loan the company would again commence operations.

On March 6th the ratepayers of Medicine Hat, Alta., will vote on the following by-laws: $10,000 for market buildings; $25,000 for gas system extensions, and $40,000 for waterworks extensions.

A by-law to raise $40,000 by debentures for the extension of the telephone system, one to provide $60,000 for electric power and light, one for $5,000 for a municipal isolation hospital, $20,000 to build and equip two fire halls, have all been approved of by the city council, Edmonton, Alta.

Application will be made by the town of Battleford, Sask., to the Legislative Assembly of Saskatchewan for an act confirming the by-law to spend $90,000 for the purpose of providing a water supply and waterworks system, constructing a sewage system, and building and operating an electric light and power plant and also a by-law for $10,000 for the purpose of granting a bonus to a mill company.

Building Notes.

The Imperial Trusts Co., of Canada, are considering the erection of an office building in Toronto, at a cost of about $40,000.

A new central post office will be erected in Quebec, at a cost of $50,000.

J. H. Smith, Toronto, will erect a two-storey brick factory this spring at a cost of about $10,000.

Plans are under consideration for the erection of a new wing in connection with the Collegiate Institute at Brockville, Ont.

The plans of the proposed school board offices for Toronto are reported to be well in hand. The estimated cost is $110,000.

Excavation has been commenced by the Government on the new $100,000 post office and customs house for Saskatoon, Sask.

Dalton & Everleigh, architects, Vancouver, have just completed plans for a sanitarium to be erected near Kamloops, B.C. Estimated cost $50,000.

A company in Winchester, Ont., known as Winchester Hotel Company, is being incorporated with a capital of $40,000 to erect a hotel in that place.

The erection of a new Catholic girls' school at Pointe St. Charles, Montreal, at a cost of $30,000, and the enlargement of the Meilleur school is being discussed by the Catholic school commissioners, Montreal.

It is understood that the G.T.R. and the Canadian Railway News Company have completed the purchase of forty acres of land at Norway Point, Que., as a site for their proposed $100,000 hotel.

General Manufacturing News.

The Vulcan Iron Works, Vancouver, B.C., are applying for a new site.

The plant of the Dickson Bridge Co., Campbellford, Ont., is completed.

The Canadian Fire Engine Co., London, Ont., capitalized at $40,000, has assigned.

A carriage factory will be erected at Barrie, Ont., by Mr. Broadway, at a cost of $4,000.

S. H. Miner is promoting another rubber factory for Granby, Que., to be erected in the spring.

It is expected that a valuable flow of natural gas will be struck in the Riding Mountains, Man.

Fire on the premises of the Dominion Pressed Steel Co., Port Elgin, Ont., damaged manufactured stock.

The factory of the Page-Hersey Iron & Tube Co., Guelph, Ont., has closed for some weeks for repairs.

$25,000 is to be expended on new buildings this season by the Silliker Car Company, at Halifax, N.S.

The factory of the Masson Boot & Shoe Co., Masson, Que., was destroyed by fire, entailing a loss of $40,000.

Large cement works and limekilns will be started at Belleville, Ont., at an estimated cost of nearly $7,000,000.

A shoe factory and a factory for cutting granite will be erected at Owen Sound, Ont., during the coming summer.

Fire at the steel plant, Sydney, N.S., destroyed a large yard crane and three motors, which were part of the crane equipment.

The National Tool & Axe Works factory, at Three Rivers, Que., owned by T. G. Hawthorne, was totally destroyed by fire. Loss, $5,000.

The B. C. Electric Railway Company have purchased the Vulcan Boiler Works property in Vancouver, with the view, it is stated, of future extensions.

The Ottawa Gas Co. and American capitalists are interested in a scheme to establish a new industry in Ottawa for the manufacture of roofing and other tar papers.

A big lime plant, with an output of 1,000 bushels of lime per day, will shortly be started in Tyendinaga Township, Ont. A hydrating lime plant will be erected.

The Guelph Axle Works recently shipped a carload of springs to Australia. The shipment was made via G.T.R., and the car contained twenty-five tons of springs.

A writ for $51,300 was taken out at Toronto this week against the Northern Iron & Steel Co., Collingwood, Ont. The action is being taken by H. K. Wood, New York.

Owing to the small demand in the west for their product, owing to present conditions, the American-Abell Engine Co., Toronto, will shortly lay off 100 mechanics. This makes 500 hands laid off since last October.

The British Canadian Wood, Pulp and Paper Company, Limited, Vancouver, are preparing plans for the erection of their mammoth plant at Howe Sound, Charles B. Pride, of Appleton, Wis., is the architect and engineer.

The warerooms of P. D. Dods & Co., 162 McGill street, Montreal, were destroyed by fire, the loss being about $65,000. E. Schultz Son & Co., E. F. Walter & Co., and Frost & Wood also suffered loss to the extent of $25,000, $5,000 and $5,000, respectively.

The following officers were elected at the annual meeting of the Board of Trade, Calgary: Hon. president, Hon. W. H. Cushing; president, A. E. Cross; first vice-president, W. Toole; second vice-president, T. J. S. Skinner; third vice-president, A. T. Linton.

The Main Belting Co., 40 Pearl street, Buffalo, has informed Canadian Machinery, through their representative, John J. McCarthy, that they intend establishing a branch of their business in Canada. Nothing very definite has been done at present.

The Canadian Steel Rolling Mills Company will build a branch at Campbellford, Ont., the building for which will cost $60,000. In return the town has granted a free site, exemption from taxes and electric power at $10 per h.p. The company will manufacture sheet and bar steel.

It was rumored in Quebec on Feb. 1 that the Ross Rifle Factory was about to shut down, and despatches to this effect were sent to newspapers all over Ontario. Sir Charles Ross, the president of the company, denies that the factory will close and his denial was borne out by the Minister of Militia.

The Angrove Foundry, Kingston, Ont., has received the contract for the castings of fifty box cars for the Rathbun Company, of Deseronto, who have secured the contract to supply the above number of cars for the Intercolonial Railway. This makes 250 box cars that the Rathbun Company have been called upon to supply for the I.C.R. Co.

The annual meeting of the Dominion Power & Transmission Company, Hamilton, Ont., was held recently. The president, Col. Gibson, referred to the success of the company, the radial railway enterprises, and, in particular, the erection of the terminal station. He said it would likely cost about $2,000,000 to tunnel into Toronto, one of the schemes in contemplation. The net profits for the year were $3,000,000. All of last year's officers were re-elected.

Companies Incorporated.

B. O. Beland & Co., Montreal, manufacturers of machinery, have been registered.

The Standard Foundry & Mfg. Co., Longueuil, Que.; capital, $95,000; to manufacture tools, engines, boilers, machinery, hydrants, valves, etc.

The Great West Coal Co., Port Arthur, Ont.; capital, $250,000; to develop coal and other mineral lands. Provisional directors, J. Carrick, J. A. Crozier, both of Port Arthur.

Canadian Writerpress Co., Hamilton; capital, $30,000; to manufacture duplicating writing presses. Provisional directors, J. Kneeshaw, A. P. Van Flat, and G. Wenig, all of Hamilton.

The Berg Brick Machinery Co., Toronto; capital, $250,000; to manufacture brick machinery and carry on a general machinery business. Provisional directors, A. Berg, J. Berg, S. Berg, and A. Moss, all of Toronto.

The Lake Sand & Gravel Co., Toronto; capital, $40,000; to carry on a contracting and constructing business. The provisional directors include H. W. Maw, G. S. Hodgson and W. J. McKay, Toronto.

The Fusee-McFeetor's Co., Neepawa, Man.; capital, $75,000; to manufacture lumber, timber, furniture, shingles. The provisional directors include R. H. Fusee, J. McFeetors and J. McIntosh, Neepawa, Man.

The Time Saving Coupler Co., Toronto; capital, $50,000; to manufacture metal hose couplers, etc. The provisional directors include H. L. Plummer, H. E. Johnston and R. Musgrave, Toronto.

Moore & Browne, Limited, Sault Ste Marie, Ont.; capital, $000,000; to manufacture plumbing, engineering, electric, gas and waterworks supplies. The provisional directors include R. Moore, J. D. H. Browne and W. H. Hearst, Sault Ste. Marie, Ont.

The Queen City Construction Co., Ltd., Toronto; capital, $50,000; to carry on a general contracting business. Provisional directors, J. P. Holden, J. A. Jackson and E. Denise, all of Toronto.

The Collier-Cunningham Co., Ltd., Peterboro; capital, $40,000; to carry on business of electricians and to manufacture electrical apparatus. Provisional directors are, A. B. Cunningham, W. H. Collier, M. A. Morrison, R. J. Kidd and S. T. Medd, all of Peterboro.

Trade Notes.

Frankel Bros., metals, 120 George street, Toronto, have moved to corner of Don and Eastern avenues.

The name of the Strycher Pattern Works, Jarvis street, Toronto, has been changed to the Toronto Pattern Works.

The Dominion Heating & Ventilating Co., Hespeler, Ont., have just supplied a complete dry kiln outfit to Samuel Rodgers, Barrie.

Poole & Co., machinists and engineers, 25 Jarvis street, Toronto, have moved to 75 Duke street, Toronto. This firm make a specialty of repair work.

The 65 h.p. Fairbanks-Morse producer gas plant, which has been installed by R. O. Hube, proprieter of the electric lighting plant at Drayton, Ont., is now operating satisfactorily.

The Smart-Turner Machine Co., Ltd., Hamilton, Ont., are installing one of their band power traveling cranes in the power house, Bankhead Coal Co., Bankhead, Alta.

The capital stock of the Ideal Concrete Machinery Co., London, Ont., has been increased from $75,000 to $150,000. They will make additions to their plant, as stated in another column.

The Smart-Turner Machine Co. have supplied among others, the following firms with their pumps: Normal School, Stratford; T. McAvity & Sons, Ltd., St. John, N.B.; Grand Trunk Railway.

Among the sales of Duplex pumps made by the Smart-Turner Machine Co., Ltd., during the last month are; D. Morton & Sons, Hamilton; the Steamer "Turret Crown," Collingwood; the Parisian Laundry Co., Toronto; E. Long Mfg. Co., Orillia; the Fowler-Canadian Co., Hamilton.

The Ohio Blower Co., Cleveland, Ohio, has completed arrangements with the Standard Engineering Co., Toronto, Ont., under which the latter company will act as exclusive licensees and manufacturers of the "Swartwout" helico-centrifugal steam and oil separators, cast iron exhaust heads, gravity closing ventilators, etc., for the Dominion of Canada.

The annual banquet of the Waterous Engine Works Co., Brantford, was held on Feb. 15, at which there were 350 employes and their wives at the banquet. T. H. Preston, M.P.P., made a plea for the extension of the public school system, in order the better to fit the youths for mechanical pursuits.

The annual meeting of the Cataract Power Co., Hamilton, was held on Feb. 10. The directors were re-elected as follows: Col. J. M. Gibson, president; James Dixon, vice-president; J. R. Moodie, treasurer; W. C. Hawkins, secretary and general manager; John Dickenson, ex.M.L.A., J. W. Sutherland, William Rundle, Alex. Bruce, K.C., Toronto, directors.

The Northern Engineering Works, of Detroit, Mich., have furnished the Ironton Iron Co. with a 15-ton, 40-feet span Northern traveling crane. The Woburn Iron Foundry Co., Woburn, Mass., have made improvements in their foundry, installing a Newten cupola of 4 to 5 tons per hour capacity, furnished by the Northern Engineering Works, Detroit.

The Chatham Motor Car Company, which started business in the fall of 1906, have made an assignment. The company did a good business during the past summer, and it is understood that the assignment was made to facilitate a re-organization, which has been in contemplation, when a large amount of capital and new blood will be injected into the concern.

The completion of its private switching extensions on the 400-acre property of the Albany & North River Molding Sand Company, near Albany, N.Y., puts them in better shape for the prompt handling of their increasing output, than at any time since their incorporation in 1906. Some of their finer grades of sand is shipped as far west as California and British Columbia.

The new plant of the Buffalo Copper & Brass Rolling Mills will be partially served by an electric traveling crane, 10 tons capacity, 60-feet span. This crane is of the Northern type, made by the Northern Engineering Works, of Detroit, Mich. The Sioux City Foundry & Mfg. Co. have installed a 5-ton Newten cupola furnished by the Newten Engineering Works, Detroit, Mich.

New Railway in Quebec.

It is announced that construction work will commence in the spring on the North Shore Railway from Quebec to St. Catharines Bay, a distance of 155 miles. It has been claimed that St. Catharines Bay will become an important winter port.

Will Add to Machine Shop.

The London Concrete Machinery Co., London, Ont., are going to enlarge their factory in the early spring. Besides building a seventy-foot, two-storey extension, they intend to add a second storey to the present factory. Increased machine tool equipment will be wanted. This firm manufacture a full line of concrete machinery.

To Prevent Bonusing.

A bill to be shortly introduced in the Legislature by Mr. J. P. Downey aims to prevent municipalities from bonusing business concerns. This bill first proposes to repeal the old anti-bonus law and then seeks to prevent municipalities from making exemptions from taxation. In fact under the bill as it now stands the only privileges that may be granted by any municipalities are to be water and light at cost.

To Manufacture Steel Plate.

An agreement has just been signed between the town of Campbellford and a party of American capitalists, organized under the name of the Canadian Steel Rolling Mills, Limited, by which the company are to erect a $60,000 plant there for the manufacture of steel plate. The town grants them five acres of land free and ten years' exemption from taxes, except school and local improvement taxes, and also agrees to furnish them with ten to fifteen hundred electric horse-power at $10 per horse-power per year. A by-law will be submitted to the people shortly.

Amount of Steel Bounties.

The steel department of the Lake Superior Corporation during the year 1907 received in bounties from the Dominion Government $556,-268. Of this amount $177,570 was on pig iron

and $378,698 on steel. The Lake Surperior Corporation received the second largest amount in bounties, the Dominion Iron & Steel Co. receiving about $1,200,000 during the year. There is a very marked falling off in the orders on the books of the different companies of the Lake Superior Corporation, as compared with this time last year.

To Develop Canadian West.

It is expected that the next year or two will see great railroad construction in northwestern Canada. A syndicate, Northern Empire Railway, intends applying for a charter enabling it to build a line almost parallel to the C.P.R. Edmonton-Calgary branch, and also to penetrade fertile lands along the Athabasca river.

Another company is seeking power to enable it to construct a line through the districts drained by the Red river, Raven and Clearwater rivers, and thence along the Saskatchewan river.

New Electric Railway.

The Dunnville, Wellandport & Beamsville Electric Railway is being promoted by citizens of these places. Dunnville is asked to take $30,000 of the company's 5 per cent. bonds, Moulton $5,000, and Gainsboro' $10,000, the line to run from Dunnville to Wellandport and St. Ann's, to connect there with the T., H. & B. The directors are: James A. Ross, president; F. R. Lalor, M.P., vice-president; W. J. Aikens, secretary; Mayor Smith, Thomas Marshall, B. L. Edgecombe, M. L. Parry, F. J. Ramsay and E. E. Anderson. Wm. Umbenhauer, of Philadelphia, who is financing part of it, has just been over the ground.

John Inglis' Tender Recommended.

The tenders of John Inglis Company, Toronto, for a 15,000,000-gallon pumping engine and boilers, $147,530, and for a 6,000,000-gallon pumping engine and boilers, $52,700, for Toronto waterworks, were recommended by the city engineer for acceptance. These tenders were the lowest of any Toronto manufacturing concern. The Bethlehem Steel Company's tender for the 15,000,000-gallon pump was $1,900 less than that of the Inglis Company, but this being an American firm, this higher one was recommended.

It was decided by the city council to investigate the cost of a producer gas plant and engines.

Canadian Shipbuilding Co. Hope to Reorganize.

The affairs of the Canadian Shipbuilding Co., Toronto, are being wound up in the hope that the concern can be reorganized. C. R. C. Clarkson has been appointed liquidator. The company, which has been in financial difficulties for some time, recently sold its Toronto plant for about $140,000 and decided to continue operations at Bridgeburg, Ont., where it has a plant worth about $400,000. The majority of the creditors accepted a proposal to take 5 per cent. second mortgage bonds for their claims, but others refused to do so. A statement submitted showed a considerable surplus of assets over liabilities, but the fixed assets cannot be readily realized under present conditions.

Back Under Old Management.

The Electrical Construction Co., London, Ont., is now back under the old management, namely, that of E. I. Sifton. From 1897, when the business was first established, Mr. Sifton had handled the business successfully until 1906, when a minority of the shareholders, by what the courts have since proclaimed illegal methods, changed the management. Recourse was taken to law, and some weeks before the 1907 annual meeting of the shareholders, the courts gave decision in favor of the old management, and Mr. Sifton again assumed the management. At the annual meeting in January a strong body of directors were elected, and Mr. Sifton expects keen backing in going after a complete line of business.

First of Four Tunnels.

The first of the great system of tunnels and subways through which the Pennsylvania Railroad will run trains from Philadelphia under the Hudson river, across Manhattan Island and under the East river to Long Island City, has been completed. The two ends of the tunnel, one of the four connecting Manhattan Island with Long Island City, were brough together under the bed of the middle of the East river off 34th street before noon on Feb. 21st, and the steel rings composing the shell of the tube were for the first time bolted in one continuous string from shore to shore.

The work on this tube, which is 4,000 feet long, was begun in August, 1905. So accurate were the measurements of the engineers that the ends came together with a variation of only three-eighths of an inch.

Power Plant in Nova Scotia.

The Micmac Gold Mining Company, Bridgewater, N.S., are planning the installation of a power plant for their mines. It is understood that the plant will be built on a tributary of the La Have river, nine miles from the mines, where it is intended to build a dam 200 feet long and 15 feet high. Four hundred horse power will be developed now and provision will be made for considerable extensions later. The company will need two water-wheels, two generators, motors, turbine pumps, electric hoists, drills, tools, mining machinery, nine miles of wire, and about 500 cedar poles. The cost will be about $50,000. Work will be started at once. The consulting engineer is P. H. Moore, of New York, N.Y., and the secretary, W. B. Arnold, of Boston, Mass.

Fire Damage to Warehouse.

The offices and warerooms of P. D. Dods & Co., varnish and anti-rust paints manufacturers, and E. F. Walter & Co., hardware supply company, Montreal, were destroyed by fire recently, the loss being about $80,000. E. F. Walter & Co. have secured premises at 318 St. James street, and as a new stock of goods was ordered some weeks ago and was on its way from the Old Country at the time of the fire, they will be able to carry on business without interruption.

P. D. Dods' factory and paint warehouse in Pointe St. Charles was not destroyed, so that they are able to carry on business without any interruption.

P. D. Dods & Co. have secured new offices on Patrick street, near their works, from which they will direct the supply of the trade.

New Stock Not to be Issued to Present Shareholders.

Editor Canadian Machinery,—We read an item in connection with this company in Canadian Machinery, and beg to say that it is quite true that this company have applied for a charter of increased capitalization of $5,000,000, but it is not the intention to issue this increased stock to the present shareholders.

It is quite true that they will surrender present certificates in the old company for new certificates in the new company, but the amount of the increased stock has not as yet been decided on by the board of this company, nor will it be decided for several months yet. It will very largely depend on the conditions of the iron and steel trade at that time, but in any case under the most favorable circumstances it will not exceed two shares for one in the old company.

Yours truly,

THE HAMILTON STEEL & IRON CO., Limited.

Reasons for Giving Up Making of Automobiles.

The following letter from the Packard Electric Co., St. Catharines, explains itself:

Replying to your letter of January 29th, beg to say, in reference to our discontinuing the manufacture of the Oldsmobile, that the automobile outlook last fall was such that the Olds Motor Works did not feel justified in contracting for a sufficient number of cars to permit of profitable manufacture. We quite agreed with them in their opinion as to the prospects for the coming season, and as we were crowded with orders in our electrical departments, we simply threw a portion of this work over into our automobile plant and for the present shall continue to operate it on electrical work.

We do not think the Olds Motor Works have any intention of manufacturing for this season in Canada nor even assembling.

Annual Meeting of Shawinigan Water and Power Co.

The annual meeting of the shareholders of the Shawinigan Water & Power Company showed an income for 1907 of $220,000, while contracts now coming into operation will more than double this amount for 1908. This income will be earned by the utilization of slightly more than one-half of the company's available power.

The company has two main transmission lines one to Montreal and the other running south across the St. Lawrence, passing through Three Rivers, to the mining district around Black Lake and Thetford Mines. The Montreal Light, Heat & Power Company, which is the Shawinigan Company's largest customer, has an exclusive contract for its power on the Island of Montreal. Furthermore, by means of the main transmission lines or feeders, electric light and power is supplied to Three Rivers, Berthier, Joliette, Terrebonne, St. Therese, Sorel, Victoriaville and numerous other towns, so that altogether the company has a very wide market for its power.

May Increase Output by $2,000,000.

If the French treaty bill, which is before the Ottawa Legislature at the present time, comes into effect, it will probably mean that the International Harvester Co. will manufacture all their product for export to France in Canada, because of the advantageous features of the treaty. At present this company have a very large plant in Hamilton, employing 1,800 men. The amount of the company's trade with France is in the vicinity of $2,000,000; and to turn out this extra amount in Hamilton, would mean very large additions to their present plant.

This is the statement made by Mr. Zemmerman, member for Hamilton, on the floor of the House.

To manufacture this extra $2,000,000 worth of product would mean practically doubling their present works in Hamilton; and would necessitate the building of many new buildings, and the purchase of much equipment of all kinds. It is possible that some of the machine equipment might be transferred from their United States plant, with the transfer of work; but this could not be done to any great extent.

It would mean a very substantial increase to Canada's manufacturing industries; and if the change were made at an early date, it would have a great influence towards starting heavy buying again.

Why Not Supply Turned Woodenware?

The Canadian commercial agent in Manchester, Eng., writes:

From information furnished me by one of the largest houses in Manchester, the demand for turned wood of great variety is increasing, not only here, but throughout England, and that Canada does not contribute very largely in these articles affords some surprise. It is difficult to enumerate all the different kinds of turned goods required in cabinet making, as there are numerous designs of all kinds of small spindles required; the other articles that bulk largely are table legs, chair legs, sofa and dresser feet, chair stretchers and spindles, also curtain poles in various lengths and diameters, broom handles, tool handles of every description, towel rollers, towel rails, and rolling pins.

Dowels are well worth consideration, and are mostly made from birch in diameters from ¼-inch up to 1-inch, with 1-16 multiples, and should be made in 36-inch lengths, but shorter and longer lengths are marketable, but only in moderate quantities, as by far the greatest demand is for 36-in rods. Maple and oak dowels are purchased, but the trade prefers good birch. Pill boxes are largely handled here, but at present are supplied by Sweden, Norway and Finland, also round boxes for needles and pins. I have assurance that the firm I refer to will gladly afford every assistance in their power to Canadian manufacturers desirous of exporting the above goods by furnishing drawings and designs, and their address can be obtained from this office.

Revision of Australian Tariff.

The revisions in the Australian tariff which affect Canadian manufacturers is as follows.:

The following agricultural machines are free, several dutiable items having been made free: Mowers, hand-worked rakes: ploughs combined; hay tedders, horse rakes, lucerne bunchers, maize harvesters, maize binders, milking machines, moldboard plates in the rough and not cut into shape, potato raisers or diggers, potato sorters, root cutters, pulpers and graters, straw stackers, sub-surface packers, threshing machines, winnower forks (wood and steel), hand-worked cultivators and cream separators.

On the following horticultural implements, where the general tariff is 15 per cent., the preferential duty to United Kingdom is 12½ per cent. Cane loaders on wheels, channel-making graders, garden and field spraying machines, garden and field rollers, garden hose reels, garden syringes, horse road rollers and machines, lawn mowers, sweepers and sprinklers, road making ploughs, road scoops and scrapers, scoops, stump extractors, agricultural, horticultural and viticultural machinery not specially enumerated.

Important to Canadian manufacturers is the modifications of the tariff in regard to bicycles,

buggies, dogcarts, wagonettes and carriage parts. The rates now in operation are as follows:

	General Tariff. Per cent.	Preferential Tariff. U.K. Goods. per cent.
Bicycles	30	25
Motor cycles	30	25
Cycle parts	15	10
Cycle parts, n.e.i.	5	Free
Vehicles, buggies, dogcarts, etc.	35	30
Vehicles, wagons, wagonettes, etc.	35	30
Carriage wheels, bodies, springs axles, etc.	35	30
Motor cars—complete	35	30
Motor car bodies	35	25
Motor car chassis and I. R. tires for one car	5	Free
Pianos	30	25
Organs	20	20

Canadian exporters of motor cars will require to ship the 'bodies' separately, this line (the least expensive part of the car) being dutiable at 35 per cent. The chassis and one set of tires will also be shipped separately so as to benefit by the minimum duty under the general tariff of 5 per cent. The assembling of the various parts of the cars will be carried out after arrival by local mechanics.

To Establish Steel Foundry.

Rhodes, Curry & Co., Amherst, N.S., have decided to establish a large steel foundry at Moncton, for the manufacture of steel castings and general railway appliances. The company will probably occupy the old I.C.R. shops at that place.

T. & N. O. Statement.

The statement of the receipts and disbursements of the Temiskaming & Northern Ontario Railway on account of construction, is as follows:

The receipts were: Cash on hand December 31, 1906, $152.81; treasurer of Ontario, $2,429,329.15; accounts collectable, $5,660.02; accounts collectable, operation, $134,863.37; townsite sales and mining bonuses, $25,000; deposits on contracts, $15,500; interest, $225.07; unclaimed wages, $442.60; miscellaneous receipts, $6,767.19; total, $2,617,940.21.

The disbursements came to $2,617,484.70, leaving a cash balance on hand at the end of the year of $455.51.

Nova Scotia Steel Co. Have Good Year.

At a meeting of the directors of the Nova Scotia Steel Co., held in Montreal, Feb. 17, the following statement was made by the general manager:

"The business of the past year was the largest in the history of the company, and showed an increase in the output of iron and steel, but a decrease in ore and coal. Steel shipped aggregated 53,632 tons, being 25 per cent. over the preceding years. The decrease in the coal output was owing to the decision to single-shift No. 3 colliery. Profits for the year 1907 were $944,790, as compared with $960,281 for 1906. The amount at the credit of profit and loss account on January 1, 1907, was 11,180,783, which, with the profits of the year, makes a total of $2,125,574 to the credit of the account on December 31, 1907. After providing for certain special reserves, the balance is now $792,237, compared to $650,989 for the last year. The total assets of the company are $13,810,881."

Record of Manufacturing Development.

The Dominion Government have collected some valuable and interesting information in a census of manufacturing industries, taken in the middle of the regular census period from 1901 to 1911. The report published shows that the manufacturing enterprise of the Dominion has pushed rapidly forward, and that the rate of expansion and development has been eminently satisfactory. This interim census year shows a total of 15,796 industrial establishments, with an aggregate capital of $846,585,023, employing 392,530 persons, paying $165,100,011 in salaries and wages, and having an output valued at $718,352,603. Ontario leads the provinces with an aggregate investment of $397,484,705, and Quebec follows with $255,479,662. Nova Scotia is next on the list with $75,089,191, and the order of the other provinces is: British Columbia, Manitoba, New Brunswick, Alberta, Saskatchewan and Prince Edward Island. The growth of the five-year period is strikingly shown by the record of establishments having five or more employes. These show a decrease in number from 14,650 in 1900 to 12,547 in 1905, but this is due to the general process of amalgamation. Their aggregate capital increased during the same period from $446,916,487 to $833,916,155, a gain of $386,999,668. This increase of more than 86 per cent. is one of the most remarkable records of growth that the recent period of widespread development has made, and it speaks well both for the excellent natural conditions of the Dominion and the energy and ability of her industrial leaders. Among the interesting items in the list of new industries are the manufacture of aluminium and aluminium ware, with three establishments, a capital value of $745,510, and a product of $815,993; asbestos, with 12 establishments, a capital of $8,621,683, and products valued at $1,533,819; and cement blocks and tiles, with 26 establishments, a capital of $202,975, and products valued at $407,587.

Transfer of Electrical Development Co.

The Electrical Development Company, which operates a plant at Niagara Falls and transmits energy to Toronto, where it is distributed by the Electric Light Company, and is used also by the Street Railway Company, is in process of re-organization. The financial position of the company has for some time been the reverse of satisfactory. The company has issued some $8,000,000 in bonds, and it is understood that two millions more would have been issued to complete the work of construction had financial conditions been such as to permit of their sale. In addition there are $6,000,000 in common stock, the bulk of it issued at the time of the sale of the bonds as a bonus to the financiers who did the underwriting. This common stock, while it has no immediate dividend prospects, is of value in giving control of the company to its holders, and it is around the common stock that the re-organization plans centre.

This re-organization is necessary in order that the company may obtain money to maintain its credit and keep up interest payments on its bonds until the market for power is sufficiently enlarged to carry the capital charges, a condition that will probably be reached in 1910 at the latest.

Mr. William Mackenzie has made a proposition which will be considered at a meeting of the directors on Feb. 26. Mr. Mackenzie will guarantee the necessary money on condition of a surrender by the present holders of one-half of the common stock. This stock will go to the men and institutions that come to the rescue of the Electrical Development Company.

The remaining fifty per cent. of the common stock, $3,000,000 in all, will be converted into preference stock, bearing the rates of interest set forth in the circular. The holders of this preference stock will have no right to vote unless the company defaults in the payment of its bonded debt charges. This provision in effect puts the absolute control of the corporation into the hands of the holders of the remaining $3,000,000 of common stock, that is to say, of Mr. Mackenzie and his associates, so long as they keep up the interest payment on the bonds.

Something Concerning the Canadian Shipbuilding Industry.

In view of the general interest which is being taken in the shipbuilding industry in Canada because of the assignment of the Canadian Shipbuilding Co., and the sale of their machine shop and boiler shop in Toronto to A. Berg & Sons, and the rumors concerning the shipbuilding merger, and the agitation which is being carried on in some quarters to afford the industry better protection, the following letter received by Canadian Machinery from the Collingwood Shipbuilding Co. is of considerable significance and interest:

Editor Canadian Machinery,

"We are now running our plant in a moderate way with a view to operating it as economically as possible. Regarding the shipbuilding merger, we are not concerned in any way in any merger of shipyards. We have the only complete shipbuilding plant in Canada capable of building up-to-date freight and passenger steamers for Great Lakes requirements. We are not in any way interested in the question of combinations of other yards.

"In explanation of this, I may say, that there has not been in the past or up to the present enough work to keep one shipyard employed, so that from an economical standpoint the only thing to do is to leave one shipyard in existence, and wipe out the other yards; and as the profits from shipbuilding are very slight, it is not likely that a combination of capital operating one shipyard could pay dividends on the capitalization of the combination merger. Furthermore, it is not possible to run a shipyard with machine shop and boiler shop operating in one district, new ships being constructed in another district, and repairs carried on at some other point, for it is necessary in carrying on repair work to have a full staff of men constantly employed in the shipyard so that repair work can be carried out quickly to enable the vessels to get into commission as soon as possible, so that, it is not possible to carry on a repair plant without building new ships at the same time; and, under conditions existing in Canada at present, it is not possible to run a shipyard profitably on building new ships alone; and as the requirements of repairs to the machinery and boilers is in a manner peculiar to itself, these repairs must also be carried out where new engines and boilers are being built.

"Our shipbuilding plant and engineering plant is complete in every detail, and all we require is protection on our work so that we may be able to live in a country where the standard of wages is set by a protective tariff; this is the whole thing in a nut-shell. We are robbed of our new work by British shipyards, we are robbed of our repair work by American shipyards, and we must pay a standard of wages equal to the wages paid in the American shipyards on the Great Lakes, otherwise, our men would leave us and go to Buffalo, Detroit, St. Clair, etc., where they can readily secure employment once they become skilled in our class of work. We are not able to compete against the low price material and labor market of Great Britain and we are put on an unequal footing in competition for repairs with American lake yards, as their tariff on repairs prevents us from securing repair work on American ships, while they have a free hand to cut into our trade, as we have no duty on repair work done on Canadian ships in American yards."

The "World," Toronto, has taken up the question of bounties, after interviewing Thomas Long, vice-president of Collingwood Shipbuilding Co.

A bounty of say $6 a ton from the Government on building would be the means of enabling the yards now equipped in Canada to carry on operations, and might be the means of encouraging others to come into existence.

"In the absence of a bounty, or else a duty on British-built ships equivalent to a bounty, it is utterly impossible to carry on shipbuilding in Canada at present, and make it pay, said Mr. Long.

"That there is a field for business is undeniable, and it is getting larger year by year, only requiring to be developed. From 1902 till 1906, there were 78 British vessels imported and entered on the Canadian register. In 1907 orders were given for 19 ships, at a cost of about $3,000,000, $2,000,000 of which was wages. If these vessels were built in Canada the four steel shipbuilding yards in Ontario would have received the work, and when the business got going, more would be built. There were 300 old steam vessels brought over from the United States in the last ten years, besides 170 sailing vessels. Steady work would develop more and more highly skilled labor; yet with only 13 Canadian-built and owned steel vessels on the lakes, they are far superior in style, utility and workmanship to any imported vessel.

"Old Country vessels are built with very thin plating—half to three-quarters of an inch, and are not suitable to the heavy weather of the lakes, and the frequent entering and leaving port, and consequent bumping up against docks. Canadian vessels are built of inch plating, and of very strong interior construction, and need no heavy repair work, such as the British ships do. They may be all right for salt water, but the lake traffic is different.

"Most of the vessels on the Great Lakes are freighters, and they are all paying well. The vessels partly passenger and partly freight are also paying. The Northern Navigation Co. paid 8 per cent. last year. So there is a good field for building.

"Another point in connection with the shipyards that Mr. Long dwelt on was the tariff on repairs exacted by the States. Should any American vessel on the Great Lakes get into trouble and require repairs, she is only permitted to get as much done as would be barely sufficient to float her to the nearest United States repair yard, and, meagre as the repairs may be in such cases, 50 per cent. duty is exacted upon them.

"We want to have a duty of 50 per cent. imposed on Canadian or British vessels engaged in the lake trade. They receive all the care that Canada can bestow, and when these vessels are repaired in American yards, the same rate of duty imposed by the United States on Canadian repairs should be exacted for the American repairs—50 per cent.

"This is a point on which there can be no disagreement, and the Government can hardly ignore it any longer. Last year fully $250,000 went to pay for repair work done to Canadian vessels in American yards, a sum which, added to the little that is already done here, would assist the yards and dock owners very materially. At Collingwood, the dock cost $700,000 or $800,000, and if we can't get repair work our capital is just withering. It was stated last year that the amount of repairs was $200,000, but it was really $250,000. If we could get this in addition to what we have it would leave a profit.

"The cost of repairs in Canada is not higher than in the States. Besides, if we were sub-

sidized by Government, we would have to have a repair tariff. Competition always keeps down rates, also.

"It should be remembered, also, that neither Canadian nor British shipowners pay for repairs, all of which are borne by the underwriters."

Formerly there was a duty of 25 per cent. and the few Canadian-built vessels are largely the result of that protection. Then a fleet of British ships came in and the duty was removed. Consistency with the policy of building up Canada requires, it is clear, that either the duty should be restored, or a bounty granted to the home ship-builders. About $2,500,000 is invested in the shipyards of Ontario and its productiveness depends largely, if not entirely, at present, on the stimulus that would be afforded to ship-building by such a bounty of $6 a ton, as has been suggested. A bounty has the advantage of not being a deterrent, but an incentive to industry and is to be preferred, therefore, to the tariff. Once the industry with such assistance was thoroughly established, the skilled labor would be trained, the experience gained, and the economy of success, added to the already high reputation of Canadian-built vessels, would undoubtedly place Canada in a very forward position with this great interest, and would give the nation a grasp upon the carrying trade which no ambitious country can afford to neglect.

CATALOGUES OF THE TRADE.

BLUE BOOK ON GEARING—A very complete catalogue on gearing. The Horshurgh & Scott Co., Cleveland, O.

MILLING FILES—A booklet describing the Dreadnought milling file, with illustrations, manufactured by the Patent File & Tool Co., London, Eng.

ARMSTRONG POCKET BOOK—A very neat souvenir pocket book, issued by Armstrong Bros. Tool Co., Chicago. Mention Canadian Machinery.

PORTABLE HEATERS—Circular No. 13 of portable heaters for use with crude or refined oil, manufactured by the Rockwell Engineering Co., New York.

TURBINE PUMPS—Bulletin 102 issued by the John McDougall Caledonia Iron Works, Montreal, illustrating their multi-stage turbine pumps and describing successful installations.

NOISELESS PINIONS—A neat little book telling all about the new process rawhide noiseless pinions; the New Process Rawhide Co., Syracuse, N.Y. Mention Canadian Machinery.

FRICTION CLUTCHES—Catalogue C., describing, with illustrations, the various types of Johnston friction clutches manufactured by the Carlyle Johnston Machine Co., Hartford, Conn.

LOCK-NUT—Pamphlet from Dinning & Eckenstein, 205 St. James street, Montreal, illustrating and describing the Clark automatic nutlock, for use on railroads, agricultural machinery, etc.

LIFTING MAGNETS—Booklet giving description of construction and use of lifting magnets manufactured by Cutter-Hammer Clutch Co. Milwaukee, Wis. This is a reprint from Cassier's Magazine.

GAS BLAST FURNACES—Catalogue 21 issued by the Chicago Flexible Shaft Co., Chicago, giving illustrations, specifications and price list of their gas blast furnaces for all conditions of work.

THE CINCINNATI CUTTER GRINDER—A handsome and well-illustrated treatise on the grinding of cutters and reamers; the Cincinnati Milling Machine Co., Cincinnati, O. Mention Canadian Machinery.

SPIRAL RIVETED PIPE—Catalogue of spiral riveted pipe for water supply and hydraulic power. Results of several tests are also described, with illustrations. American Spiral Pipe Works, Chicago.

HOW TO CASE HARDEN—Small but interesting booklet telling how to case-harden, color and anneal with granulated raw bone; the Rogers & Hubbard Co., Middletown, Conn. Mention Canadian Machinery.

FRANKLIN DIE CAST PARTS—A small booklet telling about finished castings produced by the Franklin Dies; of interest to all machine makers. H. H. Franklin Mfg. Co., Syracuse, N.Y. Mention Canadian Machinery.

STEEL CASTINGS—A catalogue of castings made chiefly from manganese steel, by Edgar Allen & Co., Imperial Steel Works, Sheffield, Eng. Considerable space is devoted to castings for gearings and electric machinery.

PULVERIZERS—Catalogue 31 of pulverizers and crushers for limestone and all hard materials, manufactured by the Jeffrey Manufacturing Co., Columbus, Ohio. This is a very complete catalogue, and is well illustrated.

THE STUB-TOOTH GEAR—A treatise explaining the advantages of the combination of the short-gear tooth, with an increased angle of obliquity. The Fellows Gear Shaper Co., Springfield, Vt. Mention Canadian Machinery.

FURNACES AND CORE OVENS—Bulletin illustrating and describing the furnaces and core ovens made by the Buffalo Furnace Works, 229 Carolina street, Buffalo, N.Y., in which the distinctive features of these furnaces are illustrated.

SHOP FURNITURE—Booklet on machine shop conveniences and accessories, manufactured by the New Britain Machine Co., New Britain, Conn. The suggestions contained in this catalogue for handy machine shop furniture are numerous.

VERTICAL ENCLOSED PARAFFIN OIL ENGINE—Leaflet No. 30A., with full particulars and illustrations of the Allen paraffin oil engine now being placed on the Canadian market by the Hall Engineering Works, 14 Cote street, Montreal.

OIL ENGINE—Catalogue from Messrs. Chapelle and Couture, agents for the Pelapone Engine Co., Ltd., Leeds, England, describing and illustrating different styles of Pelapone engines with their dimensions and management, also the Pelapone patent friction clutch.

AMERICAN TOOL WORKS—The general sectional catalogue of the American Tool Works Co., Cincinnati, O., This is a most valuable catalogue for reference, and additional sections, as they are received from the company, can be added to this catalogue.

TEST OF BEARINGS—Bulletin No. 101, describing in detail a test made on a shaft equipped with Chapman double ball bearings, compared with one equipped with standard bearings. Published by the Chapman Double Ball Bearing Co., Toronto. Very useful data is given in the bulletin.

THE AMERICAN STEAM GAUGE AND VALVE MFG. CO.—The 1908 general catalogue of the American Steam Gauge & Valve Mfg. Co., 208-220 Camden street, Boston, Mass. This is a most complete catalogue of steam engineering supplies in the way of gauges and valves, and is a most useful catalogue of reference.

REAMINGTON OIL ENGINE—Pamphlet and catalogue describing the Reamington oil engine for stationary and marine use. It is for use in launches, factories, machine shops, printing presses, sawing, threshing, hoisting, etc., and is placed on the Canadian market by Dinning & Eckenstein, 205 St. James street, Montreal.

HOLLOW TILE FIREPROOFING—A well-gotten-up catalogue of Henry Maurer & Son, 420 East 22nd street, New York city, illustrating their "Herculean" flat arch (terra-cotta) and "Phoenix" hollow wall construction. This is of chief interest to architects and builders, and contains many testimonial letters from this class of people.

RUBBER BELT CONVEYER—Catalogue and price list from the Jeffrey Manufacturing Co., Columbus, Ohio, containing forty pages of illustrations of plants where their "Century" rubber belt conveyers are in actual use. These cuts show its use in mines, chemical works, power houses, coaling stations, pulp mills, and handling grain, mail, etc.

THE OHIO BLOWER CO., Cleveland, Ohio, has upon the press a comprehensive catalogue which bids fair to excel anything in its particular line; that of centrifugal steam and oil separators, cast iron exhaust heads and gravity closing ventilators. Requests which are sent in now will be honored just as soon as the catalogue is ready for distribution.

BOOK REVIEW.

MEN WHO SELL THINGS By Walter D. Moody; cloth binding; 295 pages; published by A. C. McClurg & Co., Chicago; price, $1.

The book is written from the observations and experiences of over twenty years as traveling salesman, European buyer, sales manager and manager. The book is written in a very breezy, and very interesting style, with many anecdotes and quotations. Besides being a work which appeals very directly to the salesman, it contains very many useful hints, suggestions and inspirations for the young salesman. The author's desire is to raise the standing of the traveling salesman.

POWER STATIONS AND TRANSMISSION—A manual of approved American practice in the construction, equipment and management of electrical generating stations, substations and transmission lines; by Geo. C. Shaad, E.E.; illustrated; 74 pages, 6x9 ins.; published by American School of Correspondence, Chicago; and sold by MacLean Publishing Co., Toronto. Price, $1.

Any person wishing to obtain practical knowledge which will be of everyday use to him on the above subjects should not be without this book. It is excellent value for the money. The book is intended for home study, and is of chief value to the man who is obtaining his knowledge from home instruction; but at the same time a technically trained man can obtain from it much practical information in good and easily read form.

The subjects considered are: Location of Station and Selection of System; Steam and Hydraulic Plants; Electrical Equipment of Stations; Station Buildings; Records and Office Management; Electrical Conductors; Distributing Systems and Transmission Lines.

STEAM ENGINE—A practical guide on the construction, operation and care of steam engines, steam turbines and their accessories; by Walter B. Snow, S. B., and Walter S. Leland, S. B.; published by American School of Correspondence, Chicago; 155 pages, 9x6 ins.; illustrated. Supplied in Canada by the MacLean Publishing Co., Toronto. Price, $1.

This book is specially adapted for home study; and like the other books published by this company, is a good work. The book is designed for the beginner and self-taught practical man, but there is information that the technically trained man should not be without. What is said in the preface is true: "The language is simple and clear; heavy technical terms and the formulae of the higher mathematics have been avoided, yet without sacrificing any of the requirements of practical instruction; the arrangement of the matter is such as to carry the reader along by easy steps to complete mastery of each subject."

The book is divided into two parts, the first being descriptive of steam engines and power house accessories, such as condensers, pumps, etc., and the steam turbine, and the second part dealing with the thermodynamics of steam.

THE GAS ENGINE IN PRINCIPLE AND PRACTICE—A book compiled from articles which have appeared in Gas Power, and from descriptive matter and tables, by A. H. Goldingham; fully illustrated; 192 pages, 6x9 ins.; published by Gas Power Publishing Co., St. Joseph, Mich.; sold by MacLean Publishing Co., Toronto. Price, $1.50.

This is distinctly a practical book on this subject, and is altogether self-contained, that is, all considerations taken up are fully considered. The features of the subject are well chosen and the subject matter and illustrations are very much to the point.

The following are the features of the book: Types of engines; valves and valve motions; governors, igniters, self-starters, etc.; complete instructions for testing; the use of crude oil, fuel oils etc., and vaporizers; notes on gas producers and gases; installation and use of waste heat; operation and connection.

CARBURETING AND COMBUSTION IN ALCOHOL ENGINES—By Ernest Sorel; translated from the French by Sherman M. Woodward, M.S., M.A., and John Preston; containing many tables and illustrations; published by John Wiley & Sons, New York; sold by MacLean Publishing Co., Toronto; price, $3.

Information on this subject is scarce, and at present there is considerable interest being taken in alcohol as fuel for internal combustion engines; therefore this book should find a good market.

The book contains an exhaustive treatment of the information dealing with physical and chemical properties of alcohol and other liquid fuels; it deals with the physical and chemical principles upon which the design of alcohol engines depend. The data given is the result of exhaustive experiments conducted by Monsieur Sorel. It is a book containing original information.

THERMODYNAMICS OF THE STEAM ENGINE—The fifth edition of this standard work, by Cecil H. Peabody; 528 pages, 6 by 9 ins.; published by John Wiley & Sons, New York; sold by MacLean Publishing Co., Toronto; price, $5.

This is a complete rewritten revision of this well-known work. It is a thorough technical investigation of steam, the steam engine and other heat engines. It is intended as a text hook for engineering students and no steam engineer's library is complete without it.

The introduction of the steam turbine has changed adiabatic calculations for steam, from an apparent academic abstraction, to a common necessity. In this edition there have been added to the Tables of Properties of Saturated Steam, columns of entropies of vaporization; and further, there has been added a table of the quality, the heat contents and volume at constant entropy, for each degree Fahrenheit. Further information is given on superheated steam. Attention is also given to the development of internal combustion engines and to the use of fuel and blast furnace gas. A chapter is given on the thermodynamics of the steam turbine, with current method of computation, and results of tests.

CALENDARS FOR 1908.

INTERCOLONIAL RAILWAY—The 1908 calendar of the I.C.R. is a handsome one, including, as usual, the moose head design.

MANUFACTURERS AND MANUFACTURERS' AGENTS.

It will pay you to watch our condensed column each month. There are many money-making propositions brought to your attention here. You may find just what you are looking for.

RATES

One insertion—25c. for 20 words; 1c. a word foreach additional word.

Yearly rate—$2.50 for twenty words or less, 10c a word for each additional word.

The above does not apply to notices under the head of "Machinery Wanted." These notices are inserted free for subscribers.

AGENCIES WANTED.

BY young man having A-1 connection with all users of power in Montreal and vicinity; 3 years with present firm. Commission basis preferred. Staple or special lines. Apply Box 91 C, CANADIAN MACHINERY, 232 McGill St., Montreal.

AGENTS WANTED.

RESIDENT Agents throughout Canada, with connections among all users of Power, to sell special class of machines, showing the users a saving of from 50 to 200 per cent. Dinning & Eckenstein 205 St. James St., Montreal. (3)

AGENT WANTED FOR CANADA.

A. G. THORNTON, LTD., practical manufacturers of drawing and surveying instruments and materials, as also photo materials for the reproduction of tracings, require the services of a gentleman who can influence business with architects, surveyors, engineers, contractors, colleges, etc. Liberal terms. Address to Paragon Works, Manchester, Eng. [3]

BELTING, PACKING, ETC.

BELTING, RUBBER, CANVAS AND LEATHER, Hose Packing, Blacksmith's and Mill Supplies at lowest price. N. Smith, 138 York Street, Toronto. (2tf)

GASOLENE ENGINE CASTINGS.

MARINE gasolene engine castings, with blue print and full instructions, etc.; 2½, 4, 6 h.p.; also complete finished outfits at $65 up; catalogue, Krug & Crosby, Hamilton. [10tf]

GREY IRON CASTINGS.

GREY IRON CASTINGS OF THE BEST QUALITY, made by the Dominion Heat & Vent Co., Hespeler. Write for particulars.

MACHINERY WANTED.

A complete outfit of Basket-making machinery. Hyslop & Son, Greensville, Ont. (3)

MACHINERY FOR SALE.

FOR SALE—one water tube boiler: eight h.p.; good for 200 pounds steam. Address Box 186, Gravenhurst, Ont.

FOR SALE—Motors—one each forty, twenty-five, sixteen and one horse power; complete nickel plating plant, machinery, belting, shafts and pulleys; large wooden tanks, lined and unlined; enamelled and galvanized wares. R. T. Wilson, liquidator, Brock Avenue, Toronto.

RUBBER STAMPS, ETC.

B. CAIRNS, MANUFACTURER OF RUBBER stamps, stencils, steel stamps, burning brands. 77-79 Queen Street East, Toronto, Ont.

MINIMUM RATE FOR PIG IRON.

The following resolution was adopted by the Philadelphia Foundrymen's Association at a recent meeting:

"Resolved, that it is the sense of the Philadelphia Foundrymen's Association that we recommend to the manufacturers of pig iron that they take united action for the purpose of establishing a minimum rate for certain standard grades of pig iron at fixed delivery points so that foundrymen may rely on the basis established for the purchase of their supply."

Mr. A. F. Lundeberg, engineer, at Stockholm, Sweden, has invented a new method for the utilization of sawdust, whereby it, when finely ground and mixed with colors and a binding material and thereafter hydraulically treated, may be employed for a number of purposes including as building material, ship-fittings and furniture.

Patents have been taken out in all civilized countries, but the invention will at present only be utilized in Sweden, where a large factory is to be built for the manufacturing of different articles from the new product, especially with the view of export.

PERSONALS.

Walter B. Snow, publicity engineer, Boston, Mass., has been elected president of the alumni association of the Massachusetts Institute of Technology.

* * *

Mr. R. S. Richardson, who has had a wide experience on the G.T.R., C.P.R. and other railroads, has been appointed assistant superintendent of the Canadian Northern Quebec Railroad with headquarters in Montreal.

* * *

Mr. S. L. Laughlin, proprietor of Guelph Electrical Works, has resigned his position with the Gilson Manufacturing Co., and will devote his time to electric and automobile business. Mr. Laughlin intends taking a trip next week to Detroit, Chicago, Milwaukee and other cities, and promises to have a full line of automobile and electric specialties for the coming spring.

* * *

Mr. C. Holden, of Winnipeg, was appointed superintendent of the city power plant and light system, of Moose Jaw, succeeding A. C. Read, who resigned.

* * *

Mr. John Erickson, who has been superintendent of the Cranbrook division of the C.P.R. for many years, is to retire. J. Brownlee, at present superintendent of the Moose Jaw division, is to succeed Superintendent Erickson.

* * *

Mr. John T. Hall, publicity commissioner of Medicine Hat, Alberta, formerly assessment commissioner of Hamilton, and to whom is due the credit in no small part for the industrial development of that city, gave an address recently before the Empire Club, Toronto, on the development of the West.

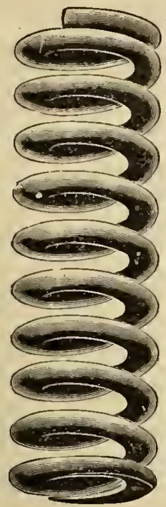
THINGS TO FORGET.

If you see a tall fellow ahead of a crowd,
A leader of men, marching fearless and proud,
And you know of a tale whose mere telling aloud
Would cause his proud head to in anguish be bowed,
It's a pretty good plan to forget it.

If you know of a skeleton hidden away
In a closet, and guarded, and kept from the day
In the dark, and whose showing, whose sudden display,
Would cause grief and sorrow and lifelong dismay,
It's a pretty good plan to forget it.

If you know of a thing that will darken the joy
Of a man or a woman, a girl or a boy,
That will wipe out a smile, or the least way annoy
A fellow, or cause any gladness to cloy,
It's a pretty good plan to forget it.

—Common-Sense.



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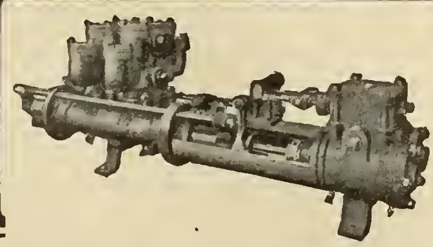

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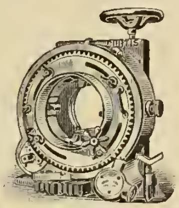
Cement Mill Machinery, Boiler and Steel Tank Work of all kinds, Grey Iron and Brass Castings



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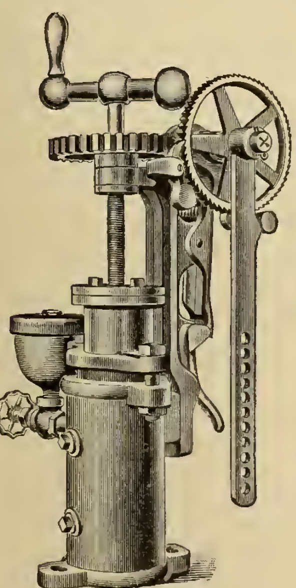

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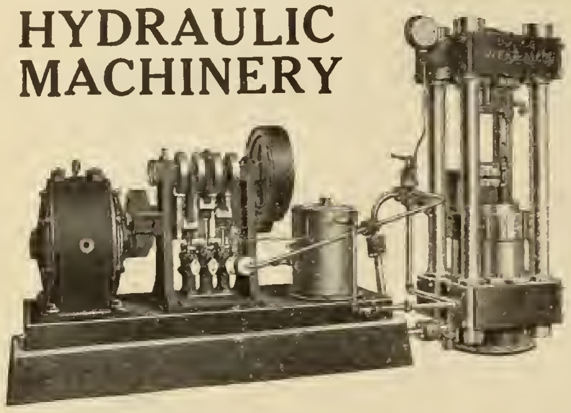

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used in various industrial operations, such as the manufacture of tubing of all kinds either seamless or brazed, of steel, copper, brass, or other material; drawn rods and shafting; cups for tanks, hot water boilers, large cartridges, or similar articles: embossed and stamped coins, medals and watch cases; punching thick blanks from sheet metal; heading, drawing, piercing, or other operations on large cartridges; stamping or pressing cold such articles as sprocket wheels, fancy hardware, leather, paper; squirting wire for fusible plugs and bullets; pressing and cooling composition eyelets, celluloid goods, insulating materials and emery wheels; testing tubing and cast iron water pipe; piercing and forming steel projectiles and bottles.

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This is the most efficient tool grinder ever invented. An easily controlled and perfectly adequate supply of water is furnished by a centrifugal pump. Every bearing is self-oiling. The propeller of the pump is loosely fitted and never touches the case, thus preventing any wear of the parts. The construction of the pump is such that leakage is absolutely prevented without the use of packing.

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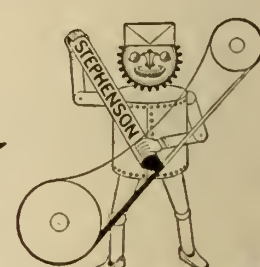

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Garlock Packing Co., Hamilton	Robb Engineering Co., Amherst, N.S.

For the purpose of making a practical test, we are always glad to send a *Free Sample* by mail on request. In writing us specify *RED* label for leather belts, or *GREEN* label for rubber or canvas. No *ONE* kind is good for *ALL* belts—you know that.

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Canadian Rand Drill Co., Montreal.
John McDougall Caledonian Iron Works Co., Montreal.

Alundum Scythe Stones
Norton Company, Worcester, Mass.

Arbors.
Cleveland Twist Drill Co., Cleveland
Owen Machine Tool Co., Springfield, Mass.

Arbor Presses.
Niles-Bement-Pond Co., New York.

Automatic Machinery.
National-Acme Mfg. Co., Cleveland
Potter & Johnston Machine Co., Pawtucket, R. I.

Automobile Parts
Globe Machine & Stamping Co., Cleveland, Ohio.

Axle Cutters.
Butterfield & Co., Rock Island, Que.
A. B. Jardine & Co., Hespeler, Ont.

Axle Setters and Straighteners.
A. B. Jardine & Co., Hespeler, Ont.

Babbit Metal.
Canada Metal Co., Toronto.
Canada Machinery Agency, Montreal
Frothingham & Workman Ltd., Montreal
Lumen Bearing Co., Toronto.
Rice Lewis & Son, Toronto.
Syracuse Smelting Works, Montreal
Tallman, J. A., & Sons, Hamilton

Baling Presses.
Perrin, Wm. R., & Co., Toronto.

Barrels, Steel Shop.
Cleveland Wire Spring Co., Cleveland.
Steel Trough & Machine Co., Tweed Ont.

Barrels, Tumbling.
Detroit Foundry Supply Co., Windsor
Dominion Foundry Supply Co., Montreal
Hamilton Facing Mill Co., Hamilton.
Gilmour J. New York.
Globe Machine & Stamping Co., Cleveland, Ohio.
John McDougall Caledonian Iron Works Co., Montreal.
Northern Engineering Works, Detroit.
H. W. Petrie, Toronto.
Sly, W. W., Mfg. Co., Cleveland
The Smart-Turner Mach. Co., Hamilton

Bars, Boring.
Hall Engineering Works, Montreal.
Niles-Bement-Pond Co., New York.

Bars, Grate.
Manitoba Iron Works Winnipeg
Wilson, J. C., & Co., Glenora, Ont.

Batteries, Storage.
Canadian General Electric Co., Toronto
Rice Lewis & Son, Toronto.
John Millen & Son, Montreal.

Bearing Metals.
Johnson, C. H., & Sons, St. Henri, Montreal
Lumen Bearing Co., Toronto.
Richelieu Foundry Co., Sorel, Que.

Bearings, Brass.
Richelieu Foundry Co., Sorel Que.

Bearings, Bronze.
Richelieu Foundry Co., Sorel, Que.

Bearings, Self-Oiling.
Wilson, J. C., & Co., Glenora, Ont.

Belting, Chain.
Canada Machinery Exchange Montreal.
Jeffrey Mfg. Co., Columbia, Ohio.
Manitoba Iron Works, Winnipeg
Waterous Engine Works Co., Brantford.

Belting, Cotton.
Canada Machinery Agency, Montreal.
Dominion Belting Co., Hamilton.
Rice Lewis & Son, Toronto.

Belt Dressing.
Stephenson Mfg. Co., Albany, N.Y.

Belting, Leather.
Canada Machinery Agency, Montreal.
The Canadian Fairbanks Co., Montreal.
Frothingham & Workman Ltd., Montreal
McLaren, J. C., Montreal.
Rice Lewis & Son, Toronto.
H. W. Petrie, Toronto.
Sadler & Haworth Montreal
Williams & Wilson, Montreal.

Belting, Rubber.
Canada Machinery Agency, Montreal.
Frothingham & Workman, Ltd., Montreal

Belting Supplies.
Rice Lewis & Son, Toronto.
H. W. Petrie, Toronto.

Bending Machinery.
John Bertram & Sons Co., Dundas, Ont.
Ferracute Machine Co., Bridgeton, N.J.
Rice Lewis & Son, Toronto
London Mach. Tool Co., Hamilton, Ont.
National Machinery Co., Tiffin, Ohio.
Niles-Bement-Pond Co., New York.

Benders, Tire.
A. B. Jardine & Co., Hespeler, Ont.
London Mach. Tool Co., Hamilton, Ont.

Blowers.
Canada Machinery Agency, Montreal.
Detroit Foundry Supply Co., Windsor
Dominion Foundry Supply Co., Toronto
Gilmour, J., New York.
Hamilton Facing Mill Co., Hamilton.
Kerr Turbine Co., Wellsville, N.Y.
Sheldon's Limited, Galt.

Blast Gauges—Cupola.
Dominion Foundry Supply Co. Toronto
Sheldons, Limited, Galt

Blocks, Tackle.
Frothingham & Workman Ltd., Montreal

Blocks, Wire Rope.
Frothingham & Workman, Ltd., Montreal

Blocks, Wire Rope & Aerial Ropeways.
Bullivant & Co., London, Eng.

Blow-Off Tanks.
Darling Bros., Ltd., Montreal.

Boilers.
Canada Foundry Co., Limited, Toronto.
Canada Machinery Agency, Montreal.
Goldie & McCulloch Co., Galt.
John McDougall Caledonian Iron Works, Montreal.
Manitoba Iron Works, Winnipeg.
Owen Sound Iron Works Co., Owen Sound
H. W. Petrie, Toronto.
Robb Engineering Co. Amherst, N.S.
The Smart-Turner Mach. Co., Hamilton.
Waterous Engine Works Co., Brantford.
Williams & Wilson, Montreal.

Boiler Compounds.
Canada Chemical Mfg. Co., London, Ont.
Hall Engineering Works, Montreal.

Boiler Makers' Supplies.
Allen, John F. New York

Bolt Cutters.
John Bertram & Sons Co., Dundas, Ont.
Hall J. H., & Son, Brantford
London Mach. Tool Co., Hamilton.
National Machinery Co., Tiffin, Ohio.
Niles-Bement-Pond Co., New York.

Bolt Drivers.
Armstrong Bros. Tool Co., Chicago

Bolt and Nut Machinery.
John Bertram & Sons Co., Dundas, Ont.
Canada Machinery Agency, Montreal.
Rice Lewis & Son, Toronto.
London Mach. Tool Co., Hamilton.
National Machinery Co., Tiffin, Ohio.
Niles-Bement-Pond Co. New York.
Waterbury Farrell Foundry & Machine Co., Waterbury Conn.

Boring & Drilling Machines
American Tool Works Co., Cincinnati.
John Bertram & Sons Co., Dundas, Ont.
Canada Machinery Agency Montreal.
A. B. Jardine & Co., Hespeler, Ont
London Mach. Tool Co., Hamilton.
Niles-Bement-Pond Co., New York.

Boring Machine, Upright.
American Tool Works Co., Cincinnati.
John Bertram & Sons Co. Dundas, Ont.
London Mach Tool Co., Hamilton.
Niles-Bement-Pond Co., New York.

Boring Machine, Wood.
Independent Pneumatic Tool Co., Chicago, Ill.
London Mach. Tool Co., Hamilton.

Boring and Turning Mills.
American Tool Works Co., Cincinnati.
John Bertram & Sons Co., Dundas, Ont.
Canada Machinery Agency, Montreal.
Gisholt Machine Co., Madison, Wis.
Rice Lewis & Son, Toronto
London Mach. Tool Co., Hamilton.
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.
Rice Lewis & Son, Toronto

Boring Tools.
Armstrong Bros. Tool Co., Chicago

Box Puller.
A. B. Jardine & Co., Hespeler, Ont.

Boxes, Lathe.
Steel Trough & Machine Co., Tweed, Ont

Boxes, Steel Shop.
Cleveland Wire Spring Co., Cleveland.
Steel Trough & Machine Co., Tweed, Ont.

Boxes, Tote.
Cleveland Wire Spring Co., Cleveland

Brass Foundry Equipment.
Ph. Bonvillain & E, Ronceray, Philadelphia
Detroit Foundry Supply Co., Detroit.
Dominion Foundry Supply Co., Montreal

Brass Working Machinery.
Warner & Swasey Co., Cleveland, Ohio.

Brushes, Foundry and Core.
Detroit Foundry Supply Co., Windsor.
Dominion Foundry Supply Co., Toronto
Hamilton Facing Mill Co., Hamilton.

Brushes, Steel.
Dominion Foundry Supply Co., Toronto

Buckets, Clam Shell.
Jeffrey Mfg. Co., Columbus, Ohio

Buckets, Crab.
Jeffrey Mfg. Co., Columbus, Ohio

Builders' Special Castings.
Richelieu Foundry Co., Sorel, Que.

Bulldozers.
John Bertram & Sons Co., Dundas, Ont.
London Mach. Tool Co., Hamilton, Ont
National Machinery Co., Tiffin, Ohio.
Niles-Bement-Pond Co., New York.

Bushes, Brass.
Richelieu Foundry Co., Sorel, Que.

Bushes, Bronze.
Richelieu Foundry Co., Sorel, Que.

Cables, Aerial and Underground.
Phillips, Eugene F., Electrical Works, Montreal

Cabinets, Lathe Tools.
Armstrong Bros. Tool Co., Chicago

Calipers.
Frothingham & Workman Ltd., Montreal
Rice Lewis & Son, Toronto.
John Millen & Son. Ltd., Montreal Que.
L. S. Starrett & Co., Athol, Mass.
Williams & Wilson Montreal.

Canners' Machinery.
Brown, Boggs Co. Hamilton
Ferracute Machine Co., Bridgeton, N.J.
Jeffrey Mfg., Columbus, Ohio
Wilson, J. C., & Co., Glenora, Ont.

Carbon.
Dominion Foundry Supply Co., Montreal

Carborundum Paper and Cloth.
Carborundum Co., Niagara Falls, N.Y.

Cars, Dryer.
Hamilton Steel Car & Engineering Works, Hamilton, Ont.

Cars, Factory & Warehouse.
Hamilton Steel Car & Engineering Works, Hamilton, Ont.

Cars, Foundry.
Detroit Foundry Supply Co., Windsor
Dominion Foundry Supply Co., Montreal
Hamilton Facing Mill Co., Hamilton.
Hammant Steel Car & Engineering Works, Hamilton Ont.

Cars, Rolling Mill.
Hammant Steel Car & Engineering Works, Hamilton

Castings, Aluminum.
Lumen Bearing Co., Toronto
Tallman, J. N., & Sons, Hamilton

Castings, Brass.
Chadwick Bros., Hamilton.
Hall Engineering Works, Montreal.
Kennedy Wm., & Sons, Owen Sound.
Lumen Bearing Co., Toronto
Manitoba Iron Works, Winnipeg
Niagara Falls Machine & Foundry Co. Niagara Falls, Ont.
Owen Sound Iron Works Co., Owen Sound.
Richelieu Foundry Co., Sorel, Que.
Robb Engineering Co., Amherst, N.S.
Tallman, J. N., & Sons. Hamilton
Wilson, J. C., & Co., Glenora Ont.

Castings, Bronze.
Richelieu Foundry Co., Sorel, Que.

Castings, Copper.
Richelieu Foundry Co., Sorel, Que.

Castings, Gear.
Richelieu Foundry Co., Sorel, Que.

Castings, Grey Iron.
Allis-Chalmers-Bullock Montreal.
Crowe's Iron Works Guelph, Ont.
Hall Engineering Works, Montreal.
Kennedy Wm., & Sons, Owen Sound
Laurie Engine & Machine Co., Montreal.
Manitoba Iron Works, Winnipeg
Maxwell, David, & Sons, St. Marys.
John McDougall Caledonian Iron Works Co., Montreal.
Niagara Falls Machine & Foundry Co., Niagara Falls. Ont
Owen Sound Iron Works Co., Owen Sound.
Richelieu Foundry Co. Sorel Que.
Robb Engineering Co., Amherst, N.S.
Smart-Turner Machine Co., Hamilton.
Wilson, J. C., & Co., Glenora, Ont.

Castings, Locomotive.
Richelieu Foundry Co., Sorel, Que.

Castings, Phosphor Bronze.
Lumen Bearing Co., Toronto

Castings, Railway.
Richelieu Foundry Co., Sorel, Que.

Castings, Steel.
Kennedy, Wm., & Sons, Owen Sound.

Castings, Semi-Steel.
Robb Engineering Co., Amherst, N.S.

Cement Machinery.
Allis-Chalmers-Bullock, Limited, Montreal
Jeffrey Mfg. Co., Columbus, Ohio.
John McDougall Caledonian Iron Works, Co., Montreal
Owen Sound Iron Works Co., Owen Sound

Centreing Machines.
John Bertram & Sons Co., Dundas, Ont.
Jeffrey Mfg Co., Columbus Ohio
London Mach. Tool Co., Hamilton, Ont.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Hartford, Conn.
Standard Bearings, Ltd., Niagara Falls

Centres, Planer.
American Tool Works Co., Cincinnati.

Centrifugal Pumps.
Gas & Electric Power Co., Toronto.
John McDougall Caledonian Iron Works Co., Montreal.
Pratt & Whitney Co., Hartford, Conn.

Centrifugal Pumps—Turbine Driven
Kerr Turbine Co., Wellsville, N.Y.

Chain, Crane and Dredge.
Frothingham & Workman, Ltd., Montreal

Chaplets.
Detroit Foundry Supply Co., Windsor.
Dominion Foundry Supply Co., Toronto
Hamilton Facing Mill Co., Hamilton.
Paxson, J. W., Co., Philadelphia

Charcoal.
Detroit Foundry Supply Co., Windsor.
Doggett, Stanley, New York
Dominion Foundry Supply Co., Toronto
Hamilton Facing Mill Co., Hamilton.
Paxson, J. W., Co., Philadelphia

Charcoal Facings.
Doggett, Stanley New York

Chemicals.
Canada Chemical Co., London.

Chemists, Industrial.
Detroit Testing Laboratory Detroit.

Chemists, Metallurgical.
Detroit Testing Laboratory, Detroit

Chemists, Mining.
Detroit Testing Laboratory, Detroit.

Chrome Brick.
Harbison - Walker Refractories Co., Pittsburg

Chucks, Drill and Lathe.
American Tool Works Co., Cincinnati.
John Bertram & Sons Co., Dundas, Ont.
Canada Machinery Agency, Montreal.
Cleveland Twist Drill Co., Cleveland
Frothingham & Workman Ltd., Montreal
Hamilton Tool Co., Hamilton, Ont.
Jacobs Mfg. Co. Hartford, Conn
Ker & Goodwin, Brantford.
London Mach. Tool Co., Hamilton.
John Millen & Son, Ltd. Montreal.
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.
Rice Lewis & Son, Toronto.
Standard Tool Co., Cleveland.

Chucks, Planer.
American Tool Works Co., Cincinnati.
Canada Machinery Agency, Montreal.
Niles-Bement-Pond Co., New York.

Chucking Machines.
American Tool Works Co., Cincinnati.
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.
Warner & Swasey Co., Cleveland, Ohio

Circuit Breakers.
Allis-Chalmers-Bullock, Limited, Montreal
Canadian General Electric Co., Toronto.
Canadian Westinghouse Co., Hamilton.
Gas & Electric Power Co., Toronto.

Clippers, Bolt.
Frothingham & Workman Ltd., Montreal
A. B. Jardine & Co., Hespeler, Ont.

Cloth and Wool Dryers.
Dominion Heating and Ventilating Co., Hespeler.
B. Greening Wire Co., Hamilton.
Sheldons Limited, Galt

Coal Boring Machines.
Cumming, J. W., New Glasgow, N.S.

Coal Handling Machinery.
Jeffrey Mfg. Co., Columbus, Ohio

Coal Miners' Tools.
Cumming J. W., New Glasgow, N.S.

Collectors, Pneumatic.
Sheldons Limited, Galt

Compressors, Air.
Allis-Chalmers-Bullock, Limited, Montreal
Canada Foundry Co., Limited, Toronto.
Canada Machinery Agency Montreal.
Canadian Rand Drill Co., Montreal.
Canadian Westinghouse Co., Hamilton.
Darling Bros., Ltd., Montreal
Detroit Foundry Supply Co. Windsor.
Gas & Electric Power Co., Toronto.
John McDougall, Caledonian Iron Works Co. Montreal
H. W. Petrie, Toronto.
The Smart-Turner Mach. Co., Hamilton.
Hall Engineering Works, Montreal, Que.
London Mach. Tool Co., Hamilton.
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.
Pratt & Whitney Co., Hartford, Conn.
Williams & Wilson, Montreal.

Concentrating Plant.
Allis-Chalmers-Bullock, Montreal.

Concrete Mixers.
Jeffrey Mfg. Co., Columbus, Ohio.

Condensers.
Canada Foundry Co., Limited, Toronto.
Canada Machinery Agency, Montreal.
Hall Engineering Works Montreal.
Smart-Turner Machine Co., Hamilton.
Waterous Engine Co., Brantford.

Consulting Engineers.
Connor, A. W., Toronto
Hall Engineering Works. Montreal.
Jules De Clercy, Montreal.
Roderick J. Parke, Toronto.
T. Pringle & Son, Montreal.
Taylor, James, White Harbor, N.S.

Contractors.
Expanded Metal and Fireproofing Co. Toronto.
Gas & Electric Power Co., Toronto.
Hall Engineering Works Montreal
Laurie Engine & Machine Co., Montreal.
Manitoba Iron Works Winnipeg
John McDougall Caledonian Iron Works Co., Montreal
Robb Engineering Co Amherst N.S.
The Smart-Turner Mach. Co., Hamilton.
Steel Trough & Machine Co., Tweed, Ont.

Contractors' Plant.
Allis-Chalmers-Bullock, Montreal.
Manitoba Iron Works, Winnipeg
John McDougall Caledonian Iron Works Co., Montreal.
Niagara Falls Machine & Foundry Co., Niagara Falls, Ont.

Controllers and Starters Electric Motor.
Allis-Chalmers-Bullock, Montreal.
Canadian General Electric Co., Toronto.
Canadian Westinghouse Co., Hamilton.
Gas Electric Power Co., Toronto.
T. & H. Electric Co., Hamilton.

Converters, Steel.
Northern Engineering Works, Detroit.

Conveyor Machinery.
Jeffrey Mfg. Co., Columbus, Ohio.
Laurie Engine & Machine Co., Montreal.
Rice Lewis & Son, Toronto
Manitoba Iron Works, Winnipeg
John McDougall Caledonian Iron Works Co., Montreal.
Smart-Turner Machine Co., Hamilton.
Waterous Engine Works Co., Brantford.
Williams & Wilson, Montreal.
Wilson, J. C., & Co., Glenora, Ont

Conveyors, Chain.
Jeffrey Mfg. Co., Columbus, Ohio

Coping Machines.
John Bertram & Sons Co., Dundas, Ont.
London Mach. Tool Co., Hamilton.
Niles-Bement-Pond Co., New York.

Core Compounds.
Buffalo Foundry Supply Co., Buffalo.
Detroit Foundry Supply Co., Windsor.
Dominion Foundry Supply Co., Toronto
Hamilton Facing Mill Co., Hamilton.

Core Ovens.
Detroit Foundry Supply Co., Windsor.
Dominion Foundry Supply Co., Toronto
Hamilton Facing Mill Co., Hamilton.
Sheldons Limited, Galt

Core Oven Bricks.
Detroit Foundry Supply Co., Windsor.
Dominion Foundry Supply Co., Toronto
Hamilton Facing Mill Co., Hamilton.

Core Sand Cleaners.
Sly, W. W., Mfg. Co., Cleveland

Core Wash.
Detroit Foundry Supply Co., Windsor.
Dominion Foundry Supply Co., Toronto
Hamilton Facing Mill Co., Hamilton.

Counterbores.
Cleveland Twist Drill Co., Cleveland

Couplings.
Manitoba Iron Works, Winnipeg
Owen Sound Iron Works Co., Owen Sound
Wilson, J. C., & Co., Glenora, Ont.

Couplings, Air.
Independent Pneumatic Tool Co., Chicago

Cranes, Electric and Hand Power.
Canada Foundry Co., Limited Toronto
Canadian Pilling Co., Montreal
Dominion Foundry Supply Co., Montreal
Gas & Electric Power Co., Toronto.
Gilmour, J., New York
Hamilton Facing Mill Co., Hamilton.
John McDougall, Caledonian Iron Works Co., Montreal.
Niles-Bement-Pond Co., New York.
Northern Engineering Works, Detroit
Owen Sound Iron Works Co., Owen Sound
Smart-Turner-Machine Co., Hamilton.

Crank Pin.
Sight Feed Oil Pump Co., Milwaukee, Wis.

Crankshafts.
St. Clair Bros., Galt

Crabs.
Frothingham & Workman, Ltd., Montreal

Crank Pin Turning Machine
London Mach. Tool Co., Hamilton.
Niles-Bement-Pond Co., New York.

Cross Head Pin.
Sight Feed Oil Pump Co., Milwaukee, Wis.

Crucibles.
Detroit Foundry Supply Co., Windsor
Dominion Foundry Supply Co., Montreal
Hamilton Facing Mill Co., Hamilton.
Seidel R. B., Inc. Philadelphia

Crucible Caps
Dominion Foundry Supply Co Montreal
Hamilton Facing Mill Co., Hamilton.

Crushers, Rock or Ore.
Allis-Chalmers-Bullock, Montreal.
Jeffrey Mfg. Co., Columbus, Ohio.

Cupolas.
Detroit Foundry Supply Co., Windsor
Dominion Foundry Supply Co., Montreal
De Clercy, J., Montreal
Gilmour J. New York.
Hamilton Facing Mill Co., Hamilton.
Northern Engineering Works, Detroit
Sheldons Limited, Galt.

Cupola Blast Gauges.
Dominion Foundry Supply Co., Montreal
Sheldons Limited, Galt

Cupola Blocks.
Detroit Foundry Supply Co., Detroit.
Dominion Foundry Supply Co., Toronto
Hamilton Facing Mill Co., Hamilton
Gilmour, J. New York.
Northern Engineering Works Detroit
Ontario Lime Association Toronto
Toronto Pottery Co., Toronto

Cupola Blowers.
Canada Machinery Agency, Montreal.
Detroit Foundry Supply Co., Windsor
Dominion Foundry Supply Co., Toronto
Dominion Heating and Ventilating Co., Hespeler
Hamilton Facing Mill Co., Hamilton.
Northern Engineering Works, Detroit
Sheldon's Limited, Galt.

Cutters, Flue
Independent Pneumatic Tool Co., Chicago, Ill.

Cutters, Gear.
Gould & Eberhardt, Newark, N.J.

Cutter Grinder Attachment.
Cincinnati Milling Machine Co., Cincinnati

Cutter Grinders, Plain.
Cincinnati Milling Machine Co., Cincinnati

Cutter Grinders, Universal.
Cincinnati Milling Machine Co., Cincinnati

Cutters, Milling.
Becker, Brainard Milling Machine Co. Hyde Park, Mass.
Cleveland Twist Drill Co., Cleveland
Frothingham & Workman Ltd., Montreal
Hamilton Tool Co., Hamilton, Ont
Owen Machine Tool Co., Springfield, Mass.
Pratt & Whitney Co., Hartford, Conn.
Standard Tool Co., Cleveland.

Cutting-off Machines.
Armstrong Bros., Tool Co., Chicago
John Bertram & Sons Co., Dundas, Ont.
Canada Machinery Agency. Montreal.
London Mach. Tool Co., Hamilton.
H. W. Petrie, Toronto.
Pratt & Whitney Co., Hartford, Conn.

Cutting-off Tools.
Armstrong Bros. Tool Co., Chicago.
London Mach. Tool Co., Hamilton.
H. W. Petrie, Toronto.
Pratt & Whitney, Hartford, Conn.
Rice Lewis & Son, Toronto.
L. S. Starrett Co., Athol, Mass.

Damper Regulators.
Darling Bros., Ltd., Montreal

Dash Weights.
Richelieu Foundry Co., Sorel, Que.

Dies
Armstrong Bros., Toronto
Brown, Boggs Co., Hamilton
Canadian Tap & Die Co., Galt
Ferracute Machine Co., Bridgeton, N.J.
Globe Machine & Stamping Co., Cleveland, Ohio.
Hall J. H., & Sons, Brantford
Hall, Jas. B., Toronto

Die Stocks
Canadian Tap & Die Co., Galt
Curtis & Curtis Co., Bridgeport, Conn.
Hart Manufacturing Co., Cleveland, Ohio
Jardine, A. B., & Co., Hespeler, Ont.

Dies, Opening
W. H. Banfield & Sons, Toronto
Globe Machine & Stamping Co., Cleveland Ohio.
Jardine, A. B. & Co., Hespeler, Ont.
Pratt & Whitney Co., Hartford, Conn.

Dies, Sheet Metal.
W. H. Banfield & Sons Toronto.
Bliss, E. W., Brooklyn, N.Y.
Consolidated Press & Tool Co. Hastings, Mich.
Ferracute Machine Co., Bridgeton, N.J.
Globe Machine & Stamping Co., Cleveland Ohio

Dies, Threading,
Canadian Tap & Die Co., Galt
Frothingham & Workman, Ltd., Montreal
Hart Mfg. Co., Cleveland
Jardine, A. B., & Co., Hespeler, Ont.
John Millen & Son, Ltd., Montreal.

Draft, Mechanical.
W. H. Banfield & Son, Toronto.
Butterfield & Co., Rock Island, Que.
A. B. Jardine & Co. Hespeler
Pratt & Whitney Co., Hartford, Conn.
Sheldons Limited, Galt.

Drawing Instruments.
Rice Lewis & Son, Toronto.

Drawn Steel, Cold.
Union Drawn Steel Co., Hamilton.

Drill Holders.
Armstrong Bros., Tool Co., Chicago

Drilling Machines, Arch Bar.
John Bertram & Sons Co., Dundas, Ont.
London Mach. Tool Co., Hamilton
Niles-Bement-Pond Co., New York.

Drilling Machines, Boiler.
American Tool Works Co., Cincinnati.
John Bertram & Sons Co., Dundas, Ont.
Bickford Drill and Tool Co., Cincinnati.
The Canadian Fairbanks Co., Montreal.
A. B. Jardine & Co., Hespeler, Ont.
London Mach. Tool Co., Hamilton, Ont.
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.
Williams & Wilson, Montreal

Drilling Machines Connecting Rod.
John Bertram & Sons Co., Dundas, Ont.
London Mach. Tool Co., Hamilton.
Niles-Bement-Pond Co. New York.

Drilling Machines, Locomotive Frame.
American Tool Works Co., Cincinnati.
John Bertram & Sons Co., Dundas, Ont.
London Mach. Tool Co., Hamilton, Ont.
Niles-Bement-Pond Co., New York.

Drilling Machines, Multiple Spindle.
American Tool Works Co., Cincinnati.
John Bertram & Sons Co., Dundas, Ont.
Bickford Drill & Tool Co., Cincinnati.
Canada Machinery Agency Montreal.
London Mach. Tool Co., Hamilton, Ont.
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.
Rice Lewis & Son, Toronto
Williams & Wilson, Montreal.

Drilling Machines, Pneumatic
Canada Machinery Agency, Montreal.
Independent Pneumatic Tool Co., Chicago, Ill.

USE OF PNEUMATIC TOOLS IN SHOPS.*

By Charles P. Whitcombe.

From actual results the following comparisons of speeds of out-turn, as compared with hand-work have been compiled; it is not claimed that these speeds are applicable to all classes of work, but that they can be generally attained and sometimes even exceeded:

Description of work	Speeds. By hand.	By pneumatic tool.
Heavy chipping ...	1	2 to 4
Calking	1	3 to 4
Drilling	1	3 to 4
Reaming	1	4 to 6
Rivetting	1 (3 men)	$1\frac{1}{2}$ to $2\frac{1}{2}$ (2 men)

The economical results achieved, so far as piece-work rates alone are concerned, are not nearly proportionate to the highest of the speeds enumerated above, but the reduced rates which have formed the subject of agreement between employers and employed enable the latter to earn higher wages in a given time, and the increased rapidity of out-turn constitutes an important item for the employers' consideration when comparing results with hand-work. The following figures show, approximately, the reductions in piece-work rates effected by the use of pneumatic tools in the United Kingdom and Germany:

Description of work.	Percentage of Hand-labor Rates. United Kingdom.	Germany.
Chipping	35 to 50	35 to 65
Calking	35 to 55	35 to 65
Drilling	40 to 60	50 to 80
Riveting	30 to 50	35 to 60
Reaming	50 to 75	....

* From a paper read at the Engineering Conference of the Institution of Civil Engineers.

WORK FOR ANARCHISTS.

It is a certain warden's hobby to give to his prisoners congenial work—work which they like and are accustomed to.

He said one day to a new convict:

"Young man, I see that you are sentenced to hard labor. Now, in providing you with work I shall take your former occupation into account. What were you?"

"An anarchist, sir," the convict replied.

"Ahem," said the warden, turning to his assistant; "then we will put this man to road blasting."—Rochester Herald.

Drilling Machines, Portable
A. B. Jardine & Co., Hespeler, Ont.
Niles-Bement-Pond Co., New York.
Niles-Bement-Pond Co. York.
W. H. Petrie, Toronto. New
Williams & Wilson Montreal

Drilling Machines, Radial.
American Tool Works Co, Cincinnati.
John Bertram & Sons Co., Dundas, Ont.
Bickford Tool & Drill Co., Cincinnati.
The Canadian Fairbanks Co., Montreal.
London Mach. Tool Co., Hamilton.
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.
Williams & Wilson, Montreal.

Drilling Machines, Suspension.
John Bertram & Sons Co., Dundas, Ont.
Canada Machinery Agency Montreal.
London Mach. Tool Co., Hamilton.
Niles-Bement-Pond Co. New York.

Drilling Machines, Turret.
John Bertram & Sons Co., Dundas, Ont
London Mach. Tool Co., Hamilton.
Niles-Bement-Pond Co., New York.

Drilling Machines, Upright.
American Tool Works Co., Cincinnati.
John Bertram & Sons Co., Dundas, Ont
Dwight Slate Machine Co., Hartford
Hamilton Tool Co., Hamilton, Ont.
A. B. Jardine & Co., Hespeler, Ont.
Rice Lewis & Son, Toronto.
London Mach. Tool Co., Hamilton.

Drills, Bench.
Hamilton Tool Co, Hamilton, Ont.
London Mach. Tool Co., Hamilton.
Pratt & Whitney Co., Hartford, Conn.

Drills, Blacksmith.
Canada Machinery Agency, Montreal.
Frothingham & Workman, Ltd., Montreal
A. B. Jardine & Co., Hespeler, Ont.
London Mach. Tool Co., Hamilton.
Standard Tool Co., Cleveland.

Drills, Centre.
Cleveland Twist Drill Co., Cleveland
Pratt & Whitney Co., Hartford, Conn.
Standard Tool Co, Cleveland, O.
L. S. Starrett Co., Athol, Mass.

Drills, Coal and Plaster.
Cumming, J. W., New Glasgow, N.S.

Drills, Electric
Canadian Pilling Co., Montreal
Gas & Electric Power Co. Toronto.
Niles-Bement-Pond Co., New York.

Drills, Gang.
American Tool Works Co., Cincinnati.
John Bertram & Sons Co., Dundas, Ont.
Pratt & Whitney Co. Hartford, Conn.

Drills, High Speed.
Cleveland Twist Drill Co, Cleveland
Frothingham & Workman, Ltd, Montreal
Alexander Gibb Montreal.
Pratt & Whitney Co., Hartford, Conn.
Standard Tool Co., Cleveland, O.

Drills, Hand.
A. B. Jardine & Co., Hespeler, Ont.

Drills, Horizontal.
John Bertram & Sons Co., Dundas, Ont.
Canada Machinery Agency. Montreal.
London Mach. Tool Co., Hamilton.
Niles-Bement-Pond Co., New York.

Drills, Pneumatic.
Allen, John F., New York
Canada Machinery Agency, Montreal.
Independent Pneumatic Tool Co., Chicago, New York
Niles-Bement-Pond Co., New York

Drills, Radial.
American Tool Works Co., Cincinnati.
John Bertram & Sons Co., Dundas, Ont.
Bickford Drill & Tool Co, Cincinnati
London Mach. Tool Co., Hamilton, Ont.
Niles-Bement-Pond Co., New York.

Drills, Ratchet.
Armstrong Bros. Tool Co, Chicago.
Cleveland Twist Drill Co., Cleveland
Frothingham & Workman, Ltd., Montreal
A. B. Jardine & Co., Hespeler,
Pratt & Whitney Co., Hartford, Conn.
Standard Tool Co., Cleveland.

Drills, Rock.
Allis-Chalmers-Bullock, Montreal.
Canadian Rand Drill Co., Montreal.
Jeffrey Mfg Co., Columbus, Ohio.

Drills, Sensitive.
American Tool Works Co., Cincinnati.
Canada Machinery Agency Montreal.
Dwight Slate Machine Co., Hartford.
Niles-Bement-Pond Co., New York

Drills, Twist.
Cleveland Twist Drill Co., Cleveland
Frothingham & Workman, Ltd., Montreal
Alex. Gibb, Montreal.
John Millen & Son, Ltd, Montreal.
Morse Twist Drill and Machine Co., New Bedford, Mass.

Pratt & Whitney Co., Hartford, Conn.
Standard Tool Co., Cleveland.
Whitman & Barnes Mfg. Co., St. Catharines, Ont

Drying Apparatus of all Kinds.
Dominion Heating & Ventilating Co., Hespeler
Sheldons Limited, Galt

Dry Kiln Equipment.
Sheldons Limited Galt

Dry Sand and Loam Facing.
Dominion Foundry Supply Co., Toronto
Hamilton Facing Mill Co., Hamilton.

Dump Cars.
Canada Foundry Co., Limited, Toronto
Dominion Foundry Supply Co, Toronto
Hamilton Facing Mill Co., Hamilton.
Jeffrey Mfg. Co. Columbus, Ohio
Manitoba Iron Works, Winnipeg
John McDougall, Caledonian Iron Works Co., Montreal.
Niles-Bement-Pond Co, New York.
Standard Bearings, Ltd., Niagara Falls.
John McDougall Caledonian Iron Works Co., Montreal.
Owen Sound Iron Works Co., Owen Sound
Waterous Engine Co., Brantford.

Duplicate Machinery.
Hall, J. H., & Sons, Brantford

Dust Arresters.
Sly, W. W., Mfg. Co., Cleveland

Dust Separators.
Dominion Heating and Ventilating Co., Hespler.
Sheldon's Limited, Galt.

Dynamos.
Allis-Chalmers-Bullock, Montreal.
Canadian General Electric Co., Toronto.
Canadian Westinghouse Co., Hamilton.
Consolidated Electric Co., Toronto
Electrical Machinery Co., Toronto.
Gas & Electric Power Co., Toronto
Hall Engineering Works, Montreal, Que.
John Millen & Son, Ltd., Montreal.
Packard Electric Co., St. Catharines.
H. W. Petrie, Toronto.
T. & H. Electric Co., Hamilton.

Dynamos—Turbine Driven.
Gas & Electric Power Co. Toronto.
Kerr-Turbine Co., Wellsville, N.Y.

Economizer, Fuel.
Dominion Heating & Ventilating Co., Hespeler

Electrical Instruments.
Canadian Westinghouse Co., Hamilton.
Gas & Electric Power Co, Toronto.

Electrical Pyrometers.
Thwing, C. B., Philadelphia

Electrical Supplies.
Canadian General Electric Co., Toronto.
Canadian Westinghouse Co., Hamilton.
Gas & Electric Power Co., Toronto
London Mach. Tool Co., Hamilton, Ont.
John Millen & Son, Ltd., Montreal.
Packard Electric Co., St. Catharines.
T. & H. Electric Co., Hamilton.

Electrical Repairs
Canadian Westinghouse Co., Hamilton.
T. & H. Electric Co., Hamilton.

Elevators.
Jeffrey Mfg Co., Columbus, Ohio

Elevator Buckets.
Jeffrey Mfg. Co., Columbus, Ohio.
Manitoba Iron Works, Winnipeg

Emery and Emery Wheels.
Dominion Foundry Supply Co., Toronto
Frothingham & Workman Ltd, Montreal
Hamilton Facing Mill Co., Hamilton.

Emery Wheel Dressers.
Canada Machinery Agency, Montreal.
Dominion Foundry Supply Co., Montreal
Frothingham & Workman Ltd., Montreal
Hamilton Facing Mill Co., Hamilton.
John Millen & Son, Ltd., Montreal.
H. W. Petrie, Toronto.
Standard Tool Co., Cleveland.

Engineers and Contractors.
Canada Foundry Co, Limited, Toronto.
Darling Bros., Ltd., Montreal
Gas & Electric Power Co., Toronto.
Hall Engineering Works, Montreal.
Laurie Engine & Machine Co., Montreal.
Manitoba Iron Works, Winnipeg
John McDougall, Caledonian Iron Works Co., Montreal.
Robb Engineering Co., Amherst, N.S.
The Smart-Turner Mach. Co., Hamilton.

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Frothingham & Workman, Ltd., Montreal
Hall Engineering Works, Montreal.
Rice Lewis & Son, Toronto.

Engines, Gas and Gasoline.
Canada Foundry Co., Toronto.
Canada Machinery Agency Montreal.
The Canadian Fairbanks Co., Montreal.
Gas & Electric Power Co., Toronto
Gilson Mfg. Co., Guelph
The Goldie & McCulloch Co., Galt, Ont.
Jones & Glassco Montreal
Rice Lewis & Son, Toronto
Ontario Wind Engine & Pump Co. Toronto
H. W. Petrie, Toronto.
The Smart-Turner Mach. Co., Hamilton

Engines, Oil.
Jones & Glassco, Montreal

Engines, Steam.
Allis-Chalmers-Bullock, Montreal
Belliss & Marcom, Birmingham, Eng.
Canada Machinery Agency, Montreal.
The Goldie & McCulloch Co., Galt, Ont.
Rice Lewis & Son, Toronto.
Laurie Engine & Machine Co., Montreal.
Gas & Electric Power Co., Toronto.
John McDougall Caledonian Iron Works Montreal.
Robb Engineering Co, Amherst, N.S.
Sheldons Limited, Galt.
The Smart-Turner Mach. Co., Hamilton.
Waterous Engine Works Co., Brantford.

Excavating Machinery.
Jeffrey Mfg Co., Columbus, Ohio

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Expanded Metal and Fireproofing Co. Toronto

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Gas & Electric Power Co, Toronto
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Fans, Exhaust.
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Gas & Electric Power Co. Toronto.
Hamilton Facing Mill Co., Hamilton.
Sheldons Limited, Galt.

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Laurie Engine & Machine Co., Montreal
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John McDougall, Caledonian Iron Works Co., Montreal.
The Smart-Turner Mach. Co., Hamilton

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Rice Lewis & Son, Toronto.
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Ontario Lime Association Toronto
Toronto Pottery Co., Toronto

Fireproofing Hollowtile.
Maurer, Henry, & Son, New York

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John McDougall, Caledonian Iron Works Co., Montreal.

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Frothingham & Workman, Ltd., Montreal
Hamilton Facing Mill Co., Hamilton.
Independent Pneumatic Tool Co., Chicago, Ill.
H. W. Petrie, Toronto.
Sheldons Limited, Galt, Ont.

Forgings, Drop.
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H. W. Petrie, Toronto.
St. Clair Bros, Galt
Wilson, J. C., & Co, Glenora, Ont.

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Manitoba Iron Works, Winnipeg

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Maxwell, David, & Sons, St. Marys
Niagara Falls Machinery & Foundry Co, Niagara Falls, Ont.
Richelieu Foundry Co, Sorel, Que.
The Smart-Turner Mach. Co., Hamilton.
Wilson J. C., & Co., Glenora, Ont.

Foundry Coke.
Baird & West, Detroit

Foundry Equipment.
Ph. Bonvillain & E. Ronceray, Philadelphia
Detroit Foundry Supply Co., Windsor.
Dominion Foundry Supply Co., Toronto
Gilmour, J, New York.
Hamilton Facing Mill Co., Hamilton
Northern Engineering Works, Detroit

Foundry Parting.
Doggett, Stanley, New York
Dominion Foundry Supply Co., Toronto
Partomol Co, New York
Foundry Specialty Co, Cincinnati
Stanley Doggett, New York

Foundry Facings.
Detroit Foundry Supply Co., Windsor.
Doggett Stanley New York
Dominion Foundry Supply Co, Toronto
Hamilton Facing Mill Co., Hamilton.

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Link-Belt Co., Philadelphia.
Manitoba Iron Works, Winnipeg

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Dominion Foundry Supply Co, Toronto
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Pratt & Whitney Co., Hartford, Conn.

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Manitoba Iron Works, Winnipeg
Wilson, J. C., & Co., Glenora, Ont.

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Becker - Brainard Milling Mach. Co. Hyde Park, Mass.
Bickford Drill & Tool Co., Cincinnati.
Dwight Slate Machine Co., Hartford
Gould & Eberhardt, Newark, N.J.
Hall, Jas. B., Toronto
London Mach. Tool Co., Hamilton.
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.
Pratt & Whitney Co., Hartford, Conn.
Williams & Wilson, Montreal.
Wilson, J C., & Co., Glenora, Ont.

Gear Hobbing Machines.
Gould & Eberhardt, Newark, N.J.

Gears, Angle.
Bolton Gear Works Norfolk Downs, Mass.
Gould & Eberhardt, Newark, N.J.
Laurie Engine & Machine Co., Montreal.

Manitoba Iron Works. Winnipeg
John McDougall, Caledonian Iron Works Co., Montreal.
Waterous Engine Co., Brantford.
Wilson, J. C., & Co., Glenora, Ont.

Gears, Cut.

Gould & Eberhardt, Newark, N.J.
Horsburgh & Scott Co., Cleveland
Wilson, J. C., & Co., Glenora, Ont.

Gears, Iron.

Boston GearWorks, Norfolk Downs, Mas.
Gould & Eberhardt, Newark, N.J.
Manitoba Iron Works, Winnipeg
Wilson, J. C., & Co., Glenora, Ont.

Gears, Mortise.

Boston Gear Works, Norfolk Downs, Mass.
Manitoba Iron Works, Winnipeg
Wilson, J. C., & Co., Glenora, Ont.

Gears, Rawhide.

Horsburgh & Scott Co., Cleveland

Gears, Reducing.

Boston GearWorks Norfolk Downs, Mass.
Gould & Eberhardt. Newark, N J.
John McDougall, Caledonian Iron Works Co., Montreal.
Wilson, J. C., & Co., Glenora, Ont.

Gears, Worm.

Gould & Eberhardt, Newark, N. J.
Horsburgh & Scott Co., Cleveland
Wilson, J. C., & Co., Glenora, Ont.

Gears and Pinions.

Gould & Eberhardt, Newark, N.J.
Manitoba Iron Works, Winnipeg
Wilson, J. C., & Co., Glenora, Ont.

General Machinery Brasses.

Richelieu Foundry Co., Sorel, Que.

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Allis-Chalmers-Bullock, Limited, Montreal
Canadian General Electric Co., Toronto
Canadian Westinghouse Co., Hamilton.
Gas & Electric Power Co., Toronto
Hall Engineering Works, Montreal.
H. W. Petrie, Toronto.
Toronto & Hamilton Electric Co. Hamilton.

Governors, Water Wheel.

Wilson, J. C., & Co., Glenora, Ont.

Graphite Paints.

P. D. Dods & Co., Montreal.

Graphite.

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Doggett, Stanley, New York
Dominion Foundry Supply Co., Toronto
Hamilton Facing Mill Co., Hamilton.

Grinders, Automatic Knife.

W. H. Banfield & Son, Toronto.

Grinders, Bench.

Hall, J. H., & Sons, Brantford.

Grinders, Centre.

Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.

Grinders, Cutter.

Becker-Brainard Milling Mach. Co., Hyde Park, Mass.
Gould & Eberhardt, Newark, N.J.
John Millen & Son, Ltd., Montreal.
Pratt & Whitney Co., Hartford, Conn.

Grinders, Disc.

Armstrong Bros. Tool Co., Chicago

Grinders, Tool.

Armstrong Bros. Tool Co., Chicago.
Blount, J G., & Co., Everett, Mass.
Gisholt Machine Co Madison, Wis.
H. W. Petrie, Toronto.
Williams & Wilson, Montreal.

Grinders, Pedestal.

Hall, J. H., & Sons, Brantford.

Grinding Holders.

Armstrong Bros. Tool Co , Chicago

Grinding Machines.

Bath Grinder Co., Fitchburg, Mass.
The Canadian Fairbanks, Montreal.
Independent Pneumatic Tool Co., Chicago Ill.
Rice Lewis & Son, Toronto.
Niles-Bement-Pond Co., New York.
Simonds Canada Saw Co., Montreal.
H. W. Petrie, Toronto.

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Blount. J G., & Co , Everett, Mass.
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John Millen & Son, Ltd., Montreal.
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.

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Norton Company, Worcester, Mass.

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Frothingham & Workman, Ltd Montreal
John Millen & Son, Ltd , Montreal.
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.
Simonds Canada Saw Co., Montreal
Williams & Wilson. Montreal.

Hack Saw Frames.

Simonds Canada Saw Co., Montreal.

Hammers, Belt Driven.

Beaudry & Co., Inc., Boston

Hammers, Drop.

Ferracute Machine Co , Bridgeton, N.J.
London Mach. Tool Co., Hamilton, Ont.
Niles-Bement-Pond Co., New York.

Hammers, Hand.

Whitman & Barnes Mfg. Co., St Catharines, Ont.

Hammers, Power.

Beaudry & Co., Inc., Boston

Hammers, Steam.

Beaudry & Co , Inc., Boston
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London Mach. Tool Co., Hamilton, Ont.
Niles-Bement-Pond Co., New York.

Hammers, Trip.

Beaudry & Co., Inc., Boston

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Borden-Canadian Co., Toronto
Canadian Tap & Die Co., Galt.
A. B. Jardine & Co., Hespeler, Ont.

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Owen Sound Iron Works Co., Owen Sound
The Smart-Turner Mach. Co., Hamilton.
Waterous Engine Co., Brantford.
Wilson, J. C., & Co.. Glenora, Ont.

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Niles-Bement-Pond Co., New York.
Northern Engineering Works, Detroit
The Smart-Turner Mach. Co., Hamilton.
Waterous Engine Co., Brantford.
Wilson, J. C., & Co., Glenora, Ont.

Hoists, Electric.

Northern Engineering Works, Detroit

Hoists, Pneumatic.

Canadian Rand Drill Co., Montreal.
Dominion Foundry Supply Co., Toronto
Hamilton Facing Mill Co., Hamilton.
Northern Engineering Works, Detroit

Hoists, Portable & Stationary.

Canadian Piling Co., Montreal

Hose, Air.

Canadian Rand Drill Co., Montreal.
Canadian Westinghouse Co., Hamilton.
Independent Pneumatic Tool Co., Chicago

Hose Couplings.

Canadian Rand Drill Co., Montreal.
Canadian Westinghouse Co., Hamilton.

Hose, Steam.

Allis-Chalmers-Bullock, Montreal.
Canadian Rand Drill Co., Montreal.
Canadian Westinghouse Co., Hamilton.
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Norton Company, Worcester, Mass.

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Hamilton Steel & Iron Co. Hamilton

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Detroit Foundry Supply Co., Windsor.
Dominion Foundry Supply Co., Toronto
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Iron Filler.

Detroit Foundry Supply Co., Windsor.
Dominion Foundry Supply Co. Toronto
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Jacks.

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Norton, A. O., Coaticook, Que.

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Dominion Foundry Supply Co.. Toronto
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Canadian Westinghouse Co., Hamilton.
Gas & Electric Power Co., Toronto
The Packard Electric Co., St.Catharines.

Lathe Dogs.

Armstrong Bros. Tool Co., Chicago.
Pratt & Whitney Co., Hartford, Conn.

Lathes, Engine.

American Tool Work Co., Cincinnati.
John Bertram & Sons Co., Dundas, Ont.
Canada Machinery Agency. Montreal.
The Canadian Fairbanks Co., Montreal.
London Mach. Tool Co., Hamilton, Ont.
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.

Lathes, Foot-Power.

American Tool Works Co., Cincinnati.

Lathes, Screw Cutting.

Niles-Bement-Pond Co., New York.

Lathes, Automatic, Screw-Threading.

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Pratt & Whitney Co., Hartford, Conn.

Lathes, Bench.

Blount, J G & Co.. Everett, Mass.
London Mach. Tool Co., London, Ont.
Pratt & Whitney Co., Hartford, Conn.

Lathes, Speed.

Blount, J. G., & Co , Everett, Mass.

Lathes, Turret.

American Tool Works Co., Cincinnati.
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Blount, J. G & Co., Everett Mass.
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Niles-Bement-Pond Co., New York.
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Canada Machinery Agency, Montreal.
The Canadian Fairbanks Co., Montreal

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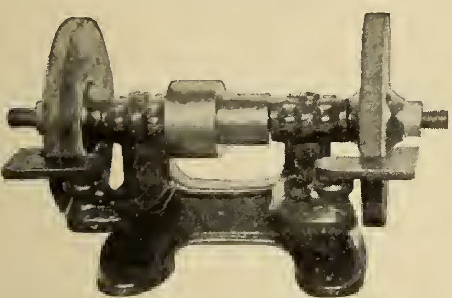

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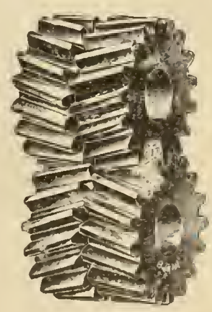

Reamers, Adjustable.
Cleveland Twist Drill Co. Cleveland
Lapointe Machine Tool Co., Hudson, Mass.
Pratt & Whitney Co., Hartford, Conn.

Reamers, One-Lock Adjustable.
Smith. Wm. J., Co., New Haven, Conn.

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Canadian Tap & Die Co., Galt.
Whitman & Barnes Mfg. Co., St. Catharines, Ont.

Reamers, Steel Taper.
Butterfield & Co., Rock Island.
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John Millen & Son Ltd., Montreal.
Pratt & Whitney Co., Hartford, Conn.
Standard Tool Co., Cleveland.
Whitman & Barnes Mfg. Co., St. Catharines Ont.

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Canadian General Electric Co., Toronto.
Canadian Westinghouse Co., Hamilton.
Gas & Electric Power Co., Toronto.
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Riveters, Pneumatic.
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Niles-Bement-Pond Co., New York.

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Canadian Westinghouse Co., Hamilton
Toronto and Hamilton Electric Co., Hamilton.

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Cairns, B., Toronto

Rubbing and Sharpening Stones.
Norton Co., Worcester, Mass.

Safes.
The Goldie & McCulloch Co., Galt,

Sand Blast Machinery.
Canadian Rand Drill Co., Montreal.
Detroit Foundry Supply Co., Windsor
Dominion Foundry Supply Co., Toronto
Hamilton Facing Mill Co., Hamilton.

Sand, Heavy, Grey Iron.
Albany & No. River Molding Sand Co., Albany N.Y.
Detroit Foundry Supply Co, Windsor
Dominion Foundry Supply Co., Montreal
Hamilton Facing Mill Co., Hamilton.

Sand, Malleable.
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Detroit Foundry Supply Co, Windsor
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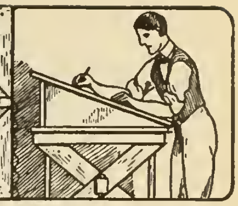

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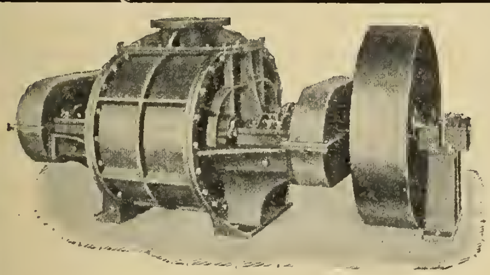

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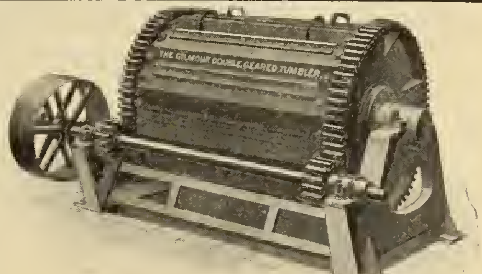

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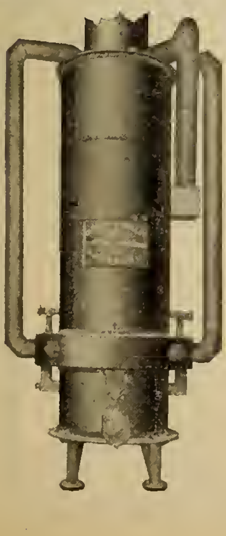

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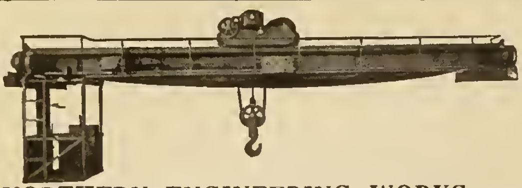

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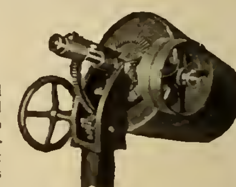

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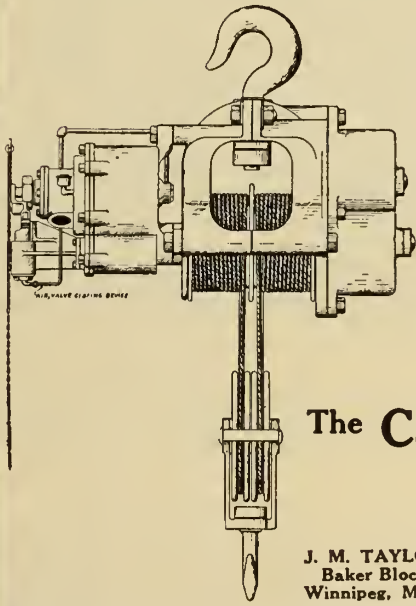

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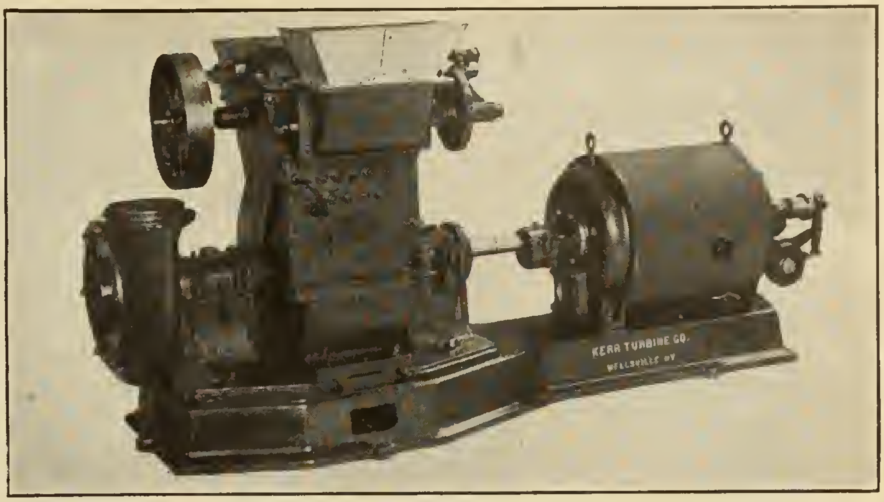

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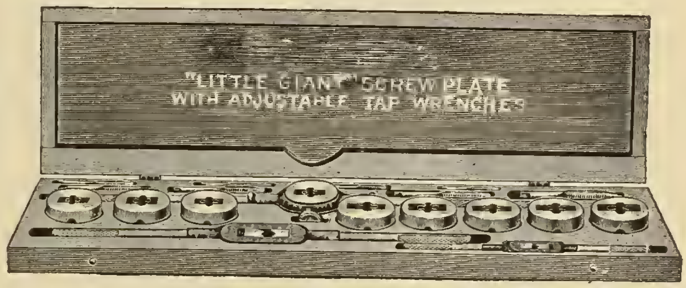
Little Giant

SEND FOR OUR CATALOG

Manufactured by

CANADIAN TAP & DIE CO. LTD.

GALT - - ONT.



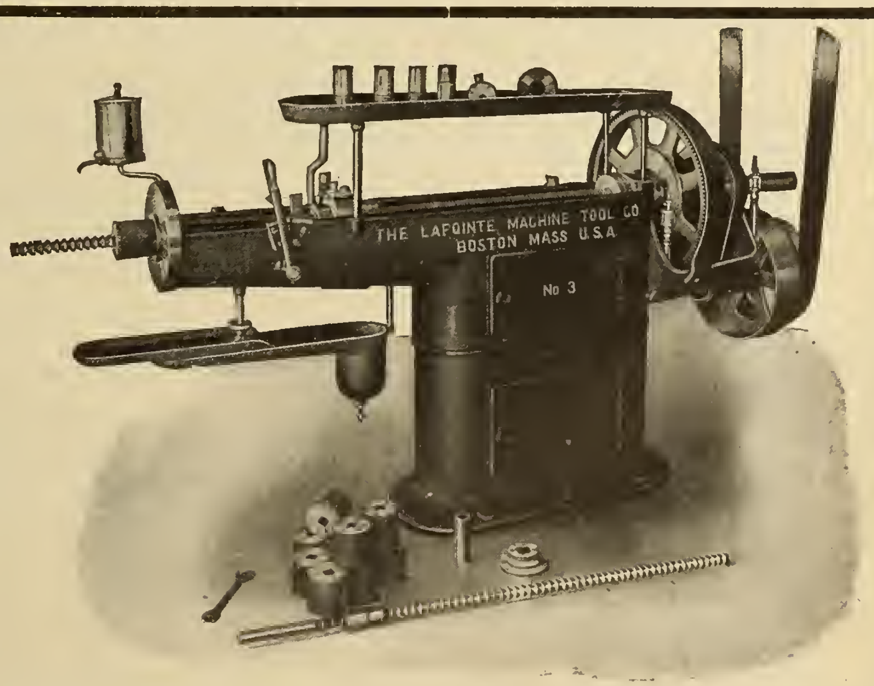
BROACHING

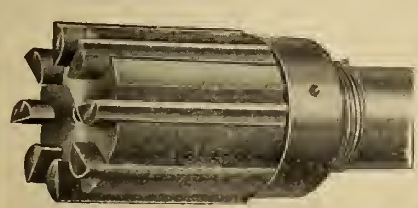
Lapointe Broaching Machine

The only and most rapid machine for broaching square holes and cutting key-ways in holes. The machine with a pull. Will earn money for you, if you have broaching to do, such as square, round, hexagon, octagon, oval, oblong, or other shaped holes, or cutting key-ways in holes. We can tell you more about it if you write us. Specialists in making broaching machines and tools.

LAPOINTE MACHINE TOOL CO.

HUDSON, MASS.





ADJUSTABLE REAMERS AHD TAPS

Made from 1 in. to 10 in. Shell or Solid Shank style. No Equal.

Lapointe Machine Tool Co.

HUDSON, - MASS.

CARBORUNDUM

Carborundum is, with the exception of the diamond, the hardest substance made, and cuts emery, corundum and all other abrasives, natural or manufactured, with ease. The crystals are hexagonal in shape, and no other known abrasive approaches them in point of sharpness. It is infusible at the highest obtainable heat, and insoluble in any of the ordinary solvents.

The Carborundum products embrace Grains, Crystals and Powders, Wheels, Dental Wheels, Discs, Cut Wheels, Sharpening Stones, Razor Hones, Scythe Stones, Knife Sharpeners, Oil Stones, Slips, Rubbing Bricks, Carborundum Paper and Cloth, and in fact, every form in which abrasives may be used.

SOLD BY

RICE LEWIS & SON, Limited

TORONTO

BLOWERS and FORGES

No. 400 Champion Blower

This Blower has revolutionized the world in making hand blast.

The adjustable ball bearings are made from the highest grade tool steel. The cups and cones are lathe turned, hardened as hard as glass, and ground to the highest possible finish, made for right or left hand fires.

Fan 12 inches diameter, with "Whirlwind" Blast Anti-clinker Heavy Nest Tuyere Iron and Pipe complete. Weight 150 lbs.

No. 1 Lever Blacksmith's Forge.

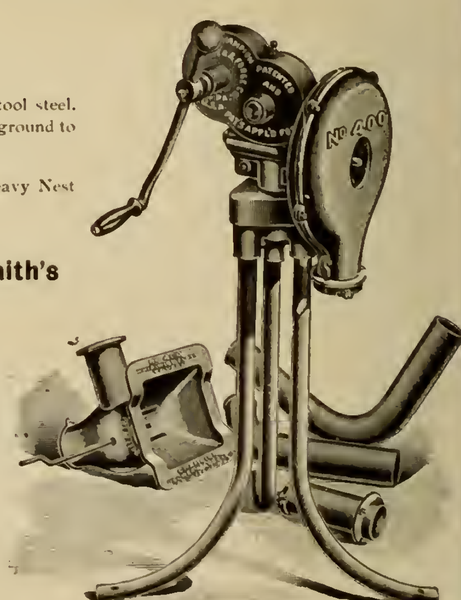
No. 1 Lever Blacksmith's Forge.

The Champion Blacksmith's Lever Forge is supplied with the Champion Standard Lever motion used on over 400,000 Blowers and Forges.

The Champion Oscillating Journal Bearings of these Forges prevent twisting and binding of the bearings.

Will produce blasts to weld iron 3" to 4" in five to ten minutes.

Supplied with Cast Iron Hearth 32" x 50". Fan 16". Height 30". Weight 375 lbs.



No. 400 Blacksmith's Blower.

SEE OUR GENERAL CATALOGUE FOR MANY OTHER STYLES

F.xW.

FROTHINGHAM & WORKMAN, Ltd.

F.xW.

WHOLESALE HARDWARE AND IRON MERCHANTS

MONTREAL, - CANADA

CIRCULATES EVERYWHERE IN CANADA

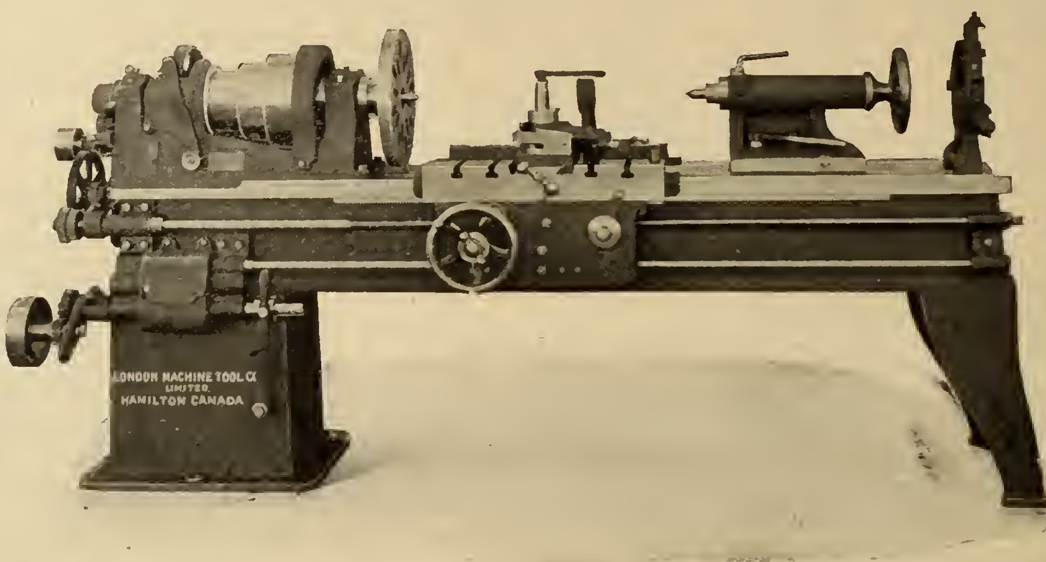
CANADIAN MACHINERY AND MANUFACTURING NEWS

A monthly newspaper devoted to the manufacturing interests, covering in a practical manner the mechanical, power, foundry and allied fields. Published by The MacLean Publishing Company, Limited, Toronto, Montreal, Winnipeg, and London, Eng.

OFFICE OF PUBLICATION : 10 FRONT STREET EAST, TORONTO

Vol. IV. April, 1908 No. 4

New Type 18" Double Back Geared
ENGINE LATHE



If you are looking for the most complete and up-to-date **Lathe** on the market, investigate our new line of **Double Back Geared Engine Lathes.** For accuracy and handiness they are unexcelled. They are made extra heavy in all parts. Spindles are of extra large diameter and made of Crucible Steel. Cone is of large diameter and wide face. Quick Change Feed Mechanism gives four instantaneous changes of feed by simply throwing over lever in front of machine. These changes can be obtained without stopping machine.

We can make prompt shipment of 18" Lathes in 8 and 10-ft. beds.

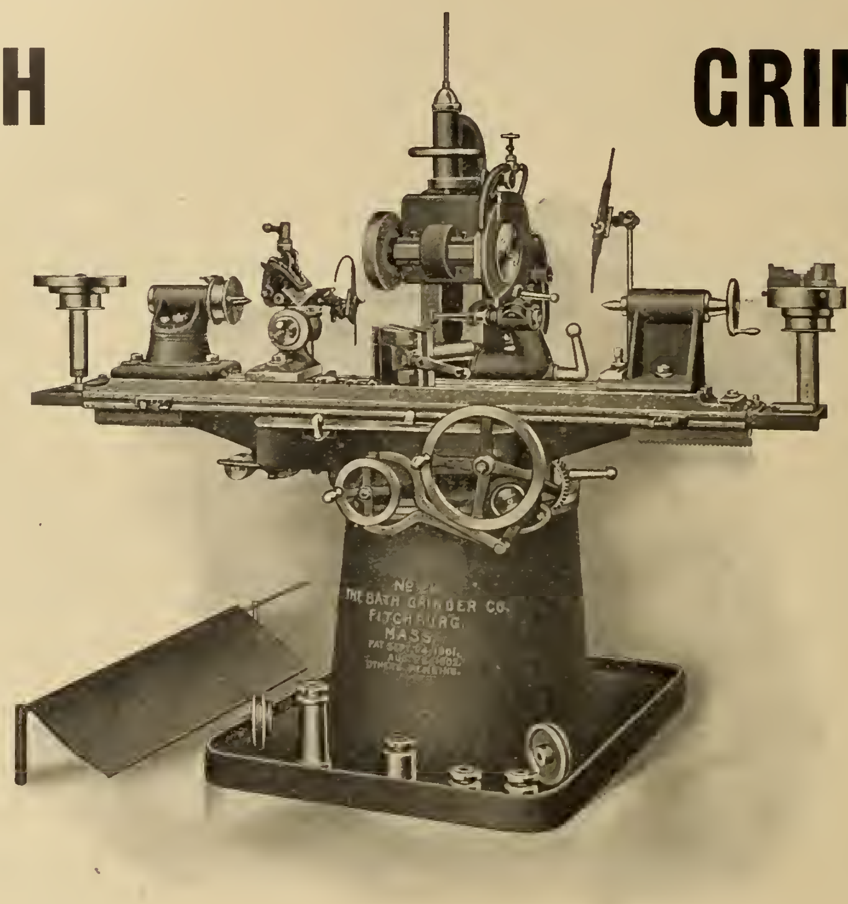
LONDON MACHINE TOOL CO., Limited

HAMILTON, CANADA

Sales Office: Traders' Bank Building, TORONTO, Canada

The Greatest Accuracy---The Utmost Economy---Real All-Round Satisfaction All the Time---Is the Result of Using the

BATH GRINDER



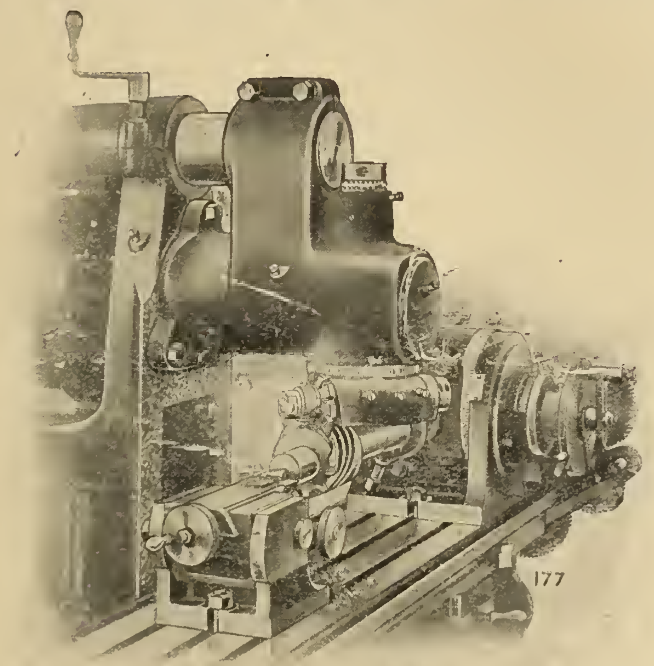
¶ The solid construction of the Bath Grinder insures absolute freedom from vibration. It is fitted with a water attachment so that it grinds wet or dry with equal success. The range of work which can be economically and successfully done on the Bath Grinder is almost unlimited. Surface work, cylindrical work on centers, internal work, all kinds of reamer and cutter work, and face grinding, can all be successfully handled by the Bath Grinder.

¶ If you are at all interested in the best grinding work it will pay you to write for our descriptive catalog.

The Bath Grinder Co., Inc.

FITCHBURG, MASS., U.S.A.

Spiral Cutting on Plain Millers



Both a Plain and a Universal Miller in one Machine.

Cincinnati Plain Millers are now arranged so that a Dividing Head or similar attachment can be geared to the lead screw for cutting spirals, the same as on Universal Machines. Since the tables of plain Millers cannot be set at an angle, our Spiral Milling Attachment is needed to complete the equipment. It will mill spirals up to about 70 degrees and as large as the Dividing Head will swing.

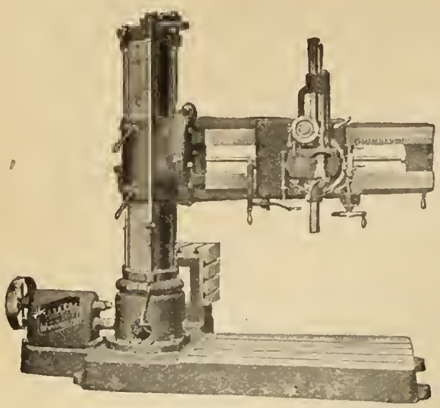
This gives you BOTH A PLAIN AND UNIVERSAL MILLER IN ONE MACHINE. This Spiral Attachment is also valuable for use on standard Universal Millers for cutting spirals having angles wider than the angle to which the table can be set.

Ask us for further details.
WE ARE MILLING SPECIALISTS.

The Cincinnati Milling Machine Company,

Cincinnati, Ohio, U. S. A.

CANADA AGENT—H. W. Petrie, Toronto and Montreal.

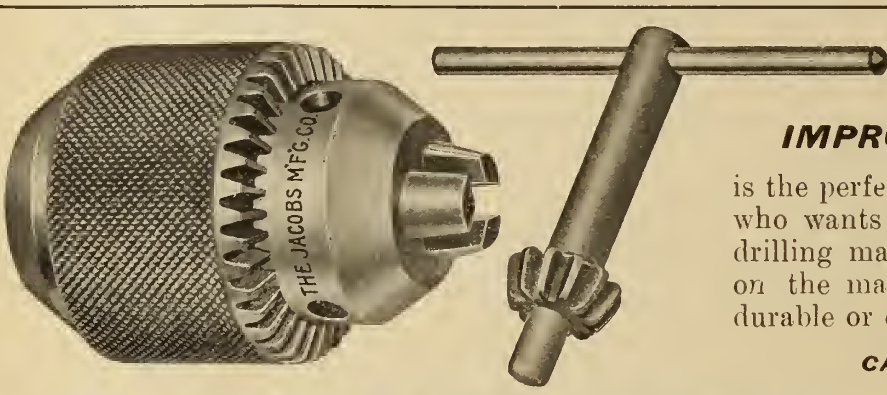


NEW UNIVERSAL RADIAL

SPECIALISTS ON

DRILLING MACHINERY

The Bickford Drill & Tool Co.,
Cincinnati, Ohio, U. S. A.



THE JACOBS

IMPROVED DRILL CHUCK

is the perfect chuck equipment for the man who wants to get the best work from his drilling machines. No other chuck like it on the market—none so accurate, strong, durable or convenient. Made in five sizes.

CATALOGUE ON REQUEST

THE JACOBS MANUFACTURING CO., HARTFORD, CONN.

A Machine with a Purpose

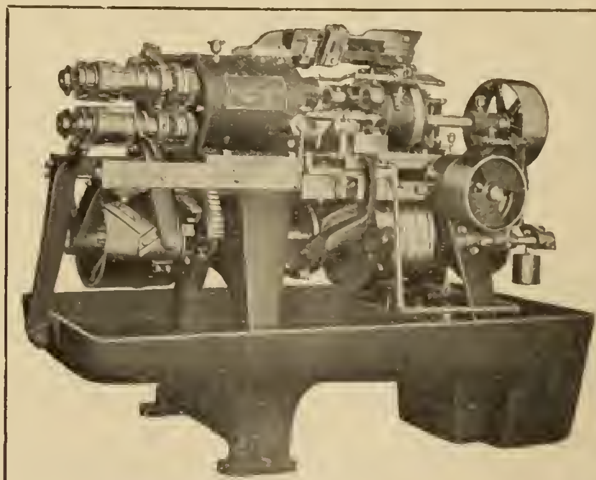
The Rapid and Economical Production of Duplicate Parts.

NAMCO

NAMCO

Every piece identical with the ones preceding it, in Accuracy in Degree of Finish.

It's the Acme way.



Capable of completing the work to a point impracticable on other machines — frequently making rehandling unnecessary.

NAMCO

NAMCO

THE ACME AUTOMATIC MUTIPLE SPINDLE SCREW MACHINE.
Built by
THE NATIONAL-ACME MANUFACTURING CO.
CLEVELAND, O.

Branch Offices: NEW YORK, BOSTON, CHICAGO, ATLANTA.

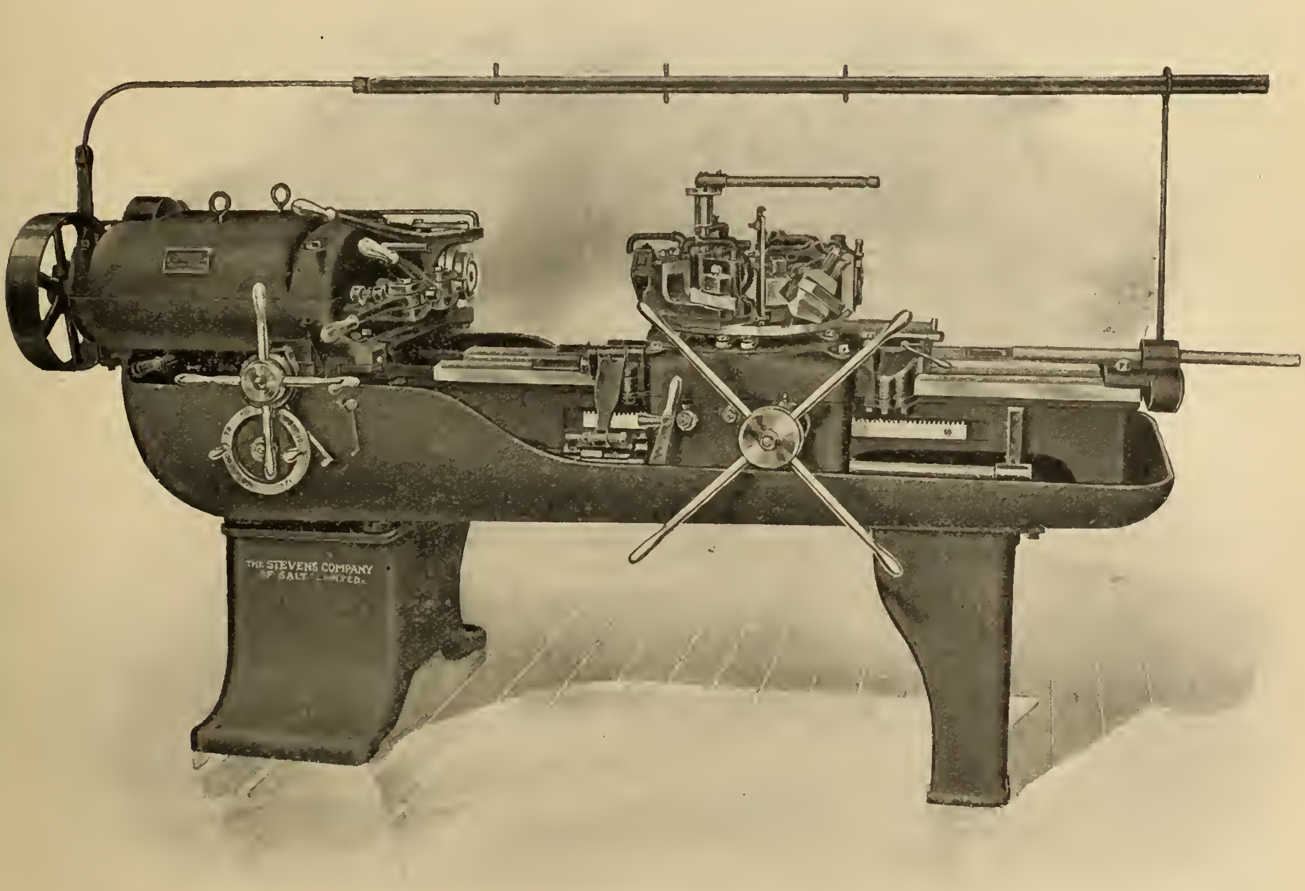
Gen. Fgn. Rep. SCHUCHARDT & SCHUTTE, ALFRED H. SCHUTTE

The JONES & LAMSON or HARTNESS TYPE

FLAT TURRET LATHE

AS BUILT BY

The Stevens Company of Galt, Limited



¶ Workmanship the very highest. All the features of the United States Machine, together with many desirable additions of our own.

¶ The Flat Turret Lathe is now recognized as indispensable in all machine shops, it being a ***remarkable profit maker.***

¶ Investigate thoroughly and you will keep your money in Canada. ***Absolutely equal to the United States built machine.***

¶ Every user of our Flat Turret Lathe is more than satisfied. Addresses of such can be obtained on application.

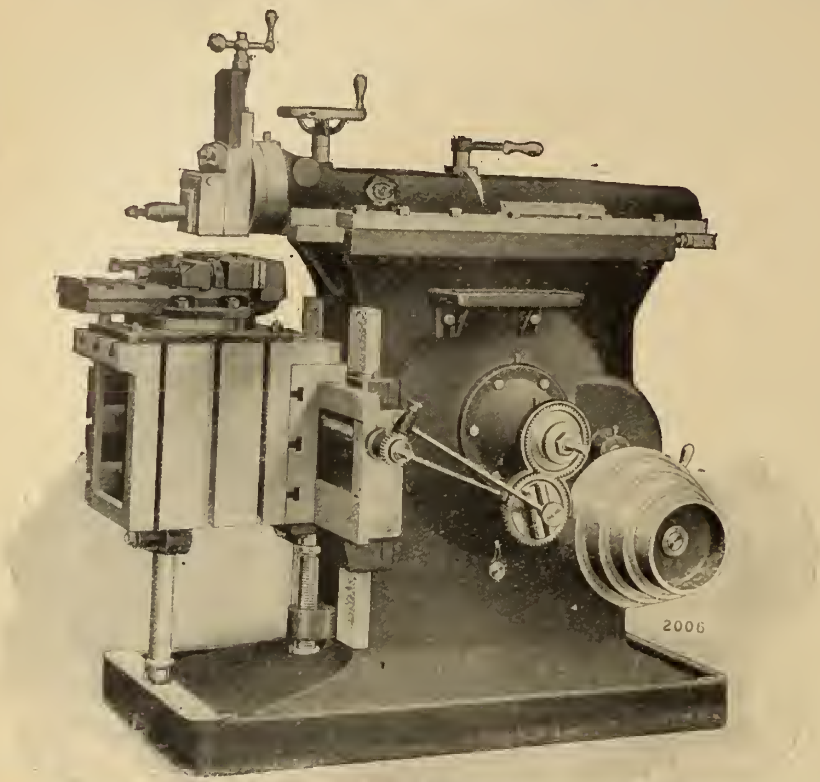
Send for full particulars and prices.

We guarantee the finest workmanship and material in every detail.

The STEVENS CO., of Galt, Limited

GALT, ONTARIO, CANADA

CINCINNATI SHAPERS



Plain Crank Shapers
B.G. Crank Shapers
Geared Rack Shapers
Traverse Shapers
Open Side Shapers

WANT A CATALOG?

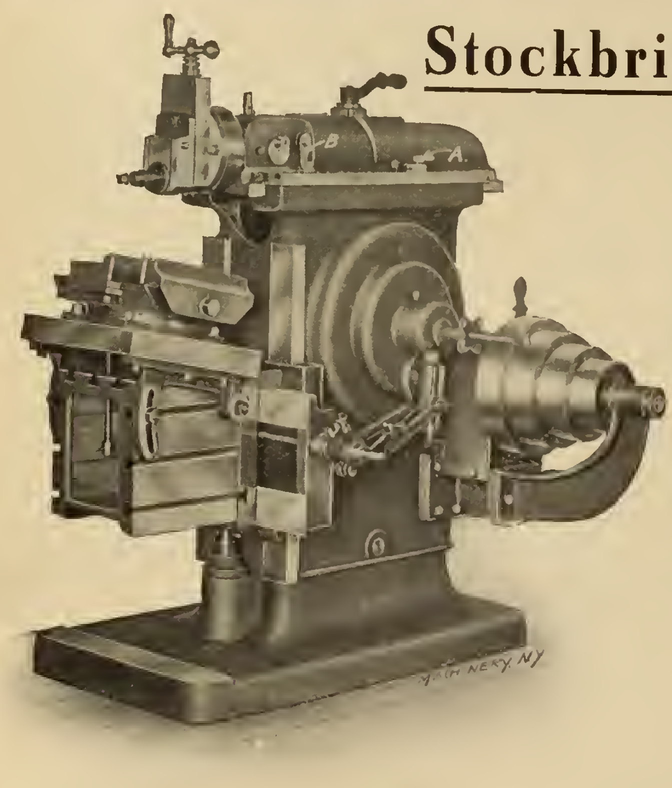
The Cincinnati Shaper Co.,

Elam Street and Garrard Avenue,

Cincinnati, O., U.S.A.

H. W. PETRIE,
MONTREAL AND TORONTO
Agent

Stockbridge Patented Shapers



"IT'S A WORKER"

GUARANTEE

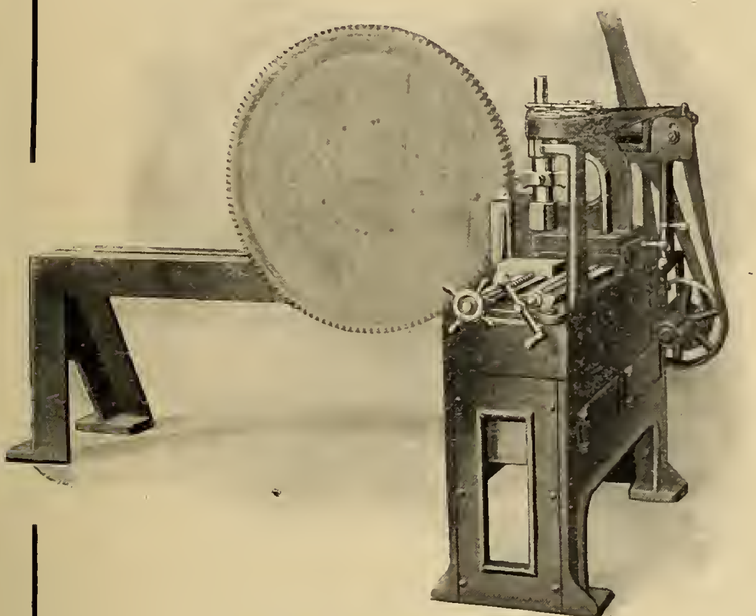
not for 30 or 90 days only, but a moral as well as a business guarantee.

We want to make good any imperfections within any reasonable time, because we buy the best in material and workmanship. If we are not getting what we pay for we want to know it, You take no chance when you buy a Stockbridge Two-Piece-Crank Shaper.

The illustration shows a 16 in. shaper with Tilting Top. The Tilting Top will be found useful in planing tapers. Especially useful on Die Work, the required clearance being easily obtained by adjusting screw. All regular Shaper attachments in stock, special attachments made to order. The letters A, B refer to our Patented Automatic Down Feed, absolutely "fool-proof." Ask for description.

Stockbridge Machine Co., Worcester, Mass., U.S.A.

75% Discount on Wood Gear Patterns



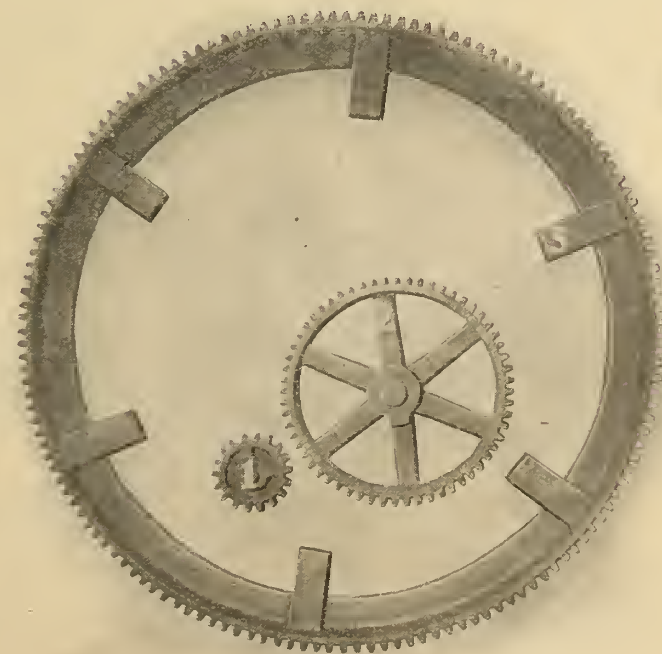
Sly's patent Combination Lathe and Gear Cutter

Put 3-4 of the cost of your gear patterns back into your pocket.

Cuts gears from 10 in. in diameter to 12 ft., and with a 2 in. face or a 2 ft. face. The machine is rigidly constructed to withstand strain due to high speed and heavy work It will cut any shape and style of tooth on spur gears.

Cut Gears taken from machine are ready for shellac without any Sand papering. Let your local pattern-maker figure on your gears and then deduct 75% and you have a liberal price of what gears will cost you cut on this machine. Gears made on this machine are absolutely perfect.

Write for samples of gear teeth, and full description of machine, with price.

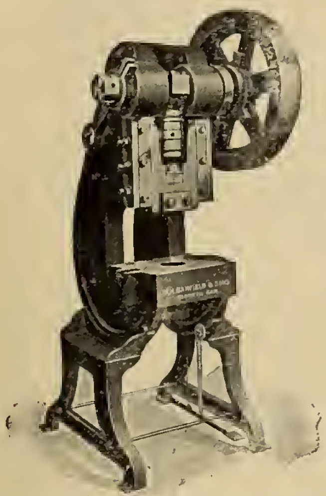


A few sizes of gears it will cut.
Gear No. 1 is 10 in. Pitch Diameter
" No. 2 " 25 " " "
" No. 3 " 82 " " "

THE
W. W. SLY MFG. CO.
CLEVELAND, OHIO.

IT PAYS TO INSTALL THE BEST

POWER PRESSES



The many exclusive features embodied in the type shown above make it so much superior to the next best that there is no comparison.

Write for prices and particulars on **Presses, Dies, Tools and Special Machinery.**

W. H. BANFIELD & SONS

120 Adelaide Street West, TORONTO.

DAYTON PNEUMATIC HAMMERS

Are the latest improved tools of their kind on the market.

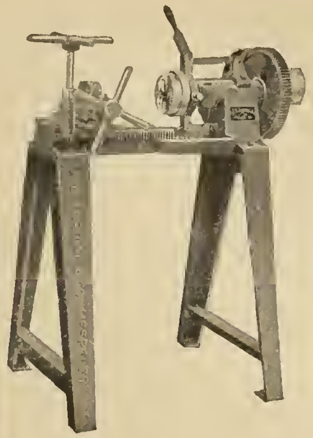
Most simple in construction and economical to maintain.

Will do more good work in a given time with less effort than any other hammer made.

CATALOG FREE

DAYTON PNEUMATIC TOOL CO.

Dayton, Ohio, U.S.A.



Bolt Threading Machine

No. 23

With opening die head, taps and dies to cut ¼ in. to 1 in.

Weight, 500 lbs. **Price, $115 net.**

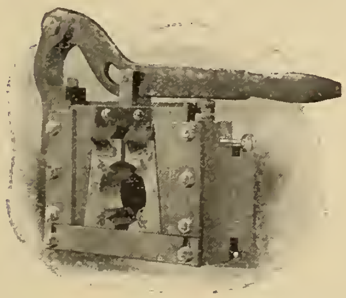
Just what is wanted in the average shop. Within its range this machine does as good work and does it as quickly as the most expensive Bolt Threader.
The opening die is a good one.

SEND FOR DESCRIPTION

A. B. JARDINE & CO.

HESPELER - ONT.

A Great Improvement in Pipe Cutting and Threading Machinery



This is a cut of the

BORDEN PATENT SOLID ADJUSTABLE DIE HEAD

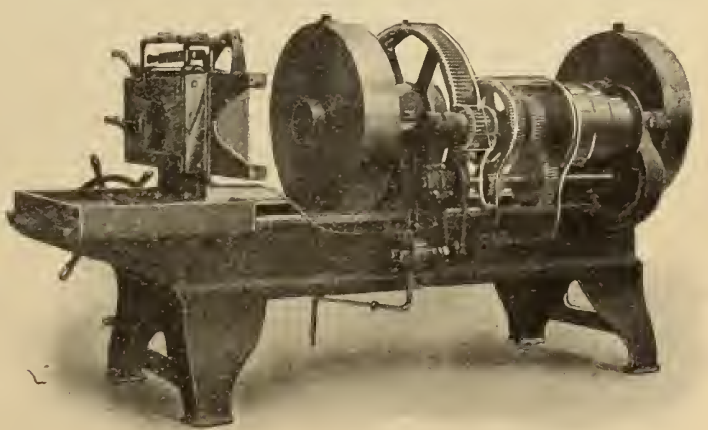
found only on our machines.

This modern device has saved thousands of dollars, by increasing the speed and accuracy of pipe cutting and threading operations. Absolute accuracy may be obtained by using the

SHANTZ No. 6

fitted with this device, by the simple adjustment of a screw upon which the operating lever rests.

This is the **Shantz** No. 6.



Wavy threads are impossible on this machine. Why not write and ask us more about it? It may result in saving you a lot of money.

I. E. SHANTZ & CO., - BERLIN, ONT.

E. W. BLISS CO.

20 ADAMS STREET, BROOKLYN, N.Y., U.S.A

EUROPEAN OFFICE, 100 Boulevard Victor Hugo, St. Ouen (Paris) France.

MANUFACTURERS OF EVERY VARIETY OF

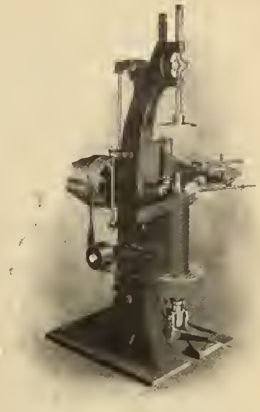
Sheet-Metal Working Machinery

Owners of the Sti es & Parker Press Co.

"Bliss" Inclinable Power Press.

Including Power Presses of all descriptions. Drop Hammers, Shears, Forming Machines, Punching Machines, Seaming Machines, Spinning Lathes, Dies for all purposes, and special machines for special work.

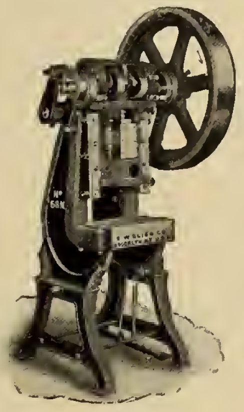
We build hundreds of styles and sizes of these machines, well designed, well built, fitted with every improvement for rapid and economical production, and sold at the right price. Write us your needs.



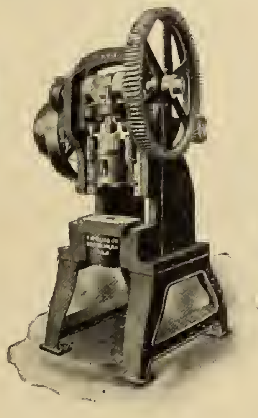
"Bliss" Double Seamer.

POWER **PRESSES**

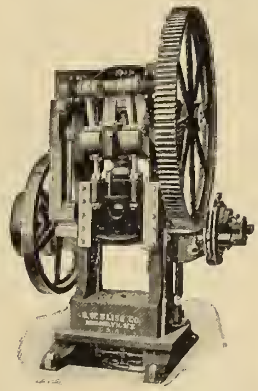
"Bliss" Straight Sided Power Press.



"Bliss" Double-Action Press.



"Bliss" Cam Drawing Press.



"Bliss" Toggle Drawing Press

"Stiles" Automatic Drop Hammer.

A "Consolidated" will never fail to make good.

Here Is a Money-Saver !

We know that you are always on the lookout for ways to save money and reduce your cost of manufacture.

We are confident that we can **PROVE** to you beyond a question that "Consolidated" presses will save a percentage of the time of your operator varying from 10% to 25%.

The "Consolidated" has all working points directly in front, within reach of the operator, so that there is no time lost in trotting around to the back of the press to make adjustments.

"Consolidated" presses have a connection that will stay where you put it (no matter how often you change it), and a clutch that will run day after day without jamming. This feature alone should save an hour a day—at 20c. an hour, three hundred hours in the year, a total of at least $60.00.

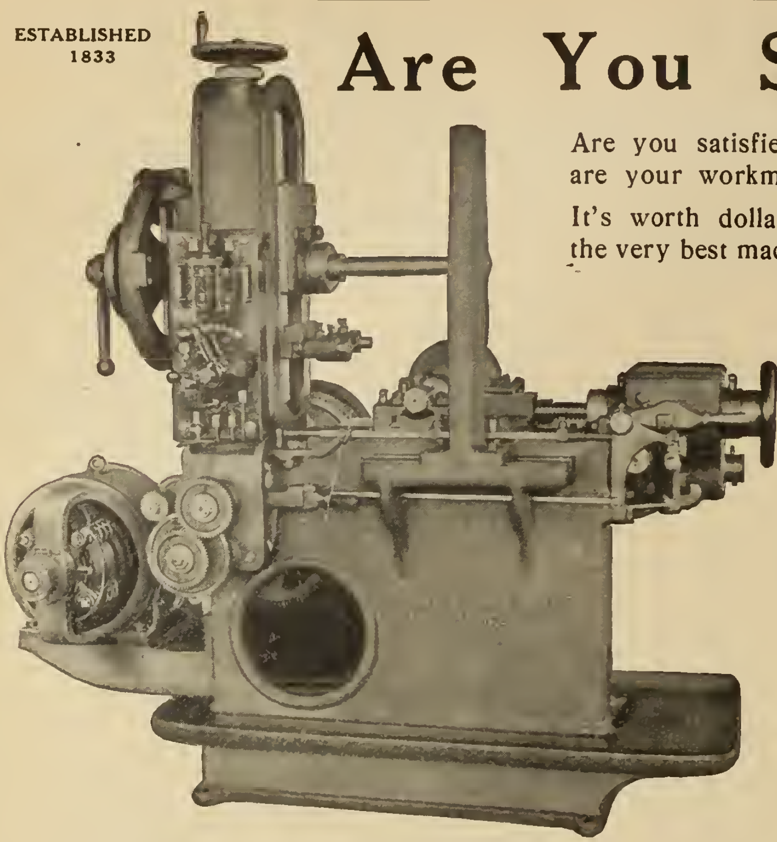
Will you not permit us to demonstrate the truth of our claim? At any rate write for a copy of our new catalogue for your library.

Consolidated Press and Tool Company

PRESSES AND SHEET METAL MACHINERY

HASTINGS - MICHIGAN

ESTABLISHED
1833



Are You Satisfied ?

Are you satisfied with your Gear-Cutting Equipment—and are your workmen satisfied as well ?

It's worth dollars and cents to you to know that you have the very best machine for accurately cutting your gears, and one that will turn out a maximum quantity of work. Our Eberhardt's Patent Automatic Gear Cutting Machines are the result of a great many years manufacturing High Class Machine Tools, of which our customers get the benefit.

If you have any gear-cutting problems, don't hesitate about writing us. We make machines from 1 to 20 feet diameter capacity, and up to as large as 6-inch circular pitch.

CATALOG ?

Let us know if you're interested in our Eberhardt's Patent Automatic Gear Hobbing Machines for accurately Generating Spur, Worm and Spiral Gears.

Gould & Eberhardt, - - Newark, N.J., U.S.A.

Designers and Manufacturers of "High Duty" Shapers and Automatic Gear Cutting Machinery

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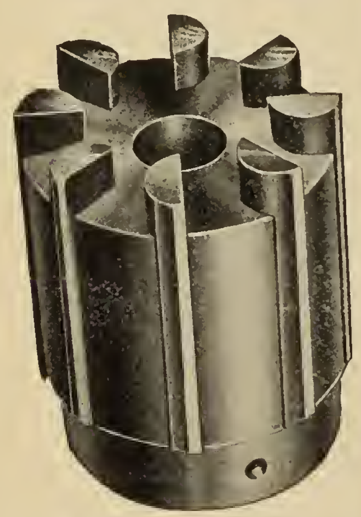
ADJUSTABLE

REAMERS AND TAPS

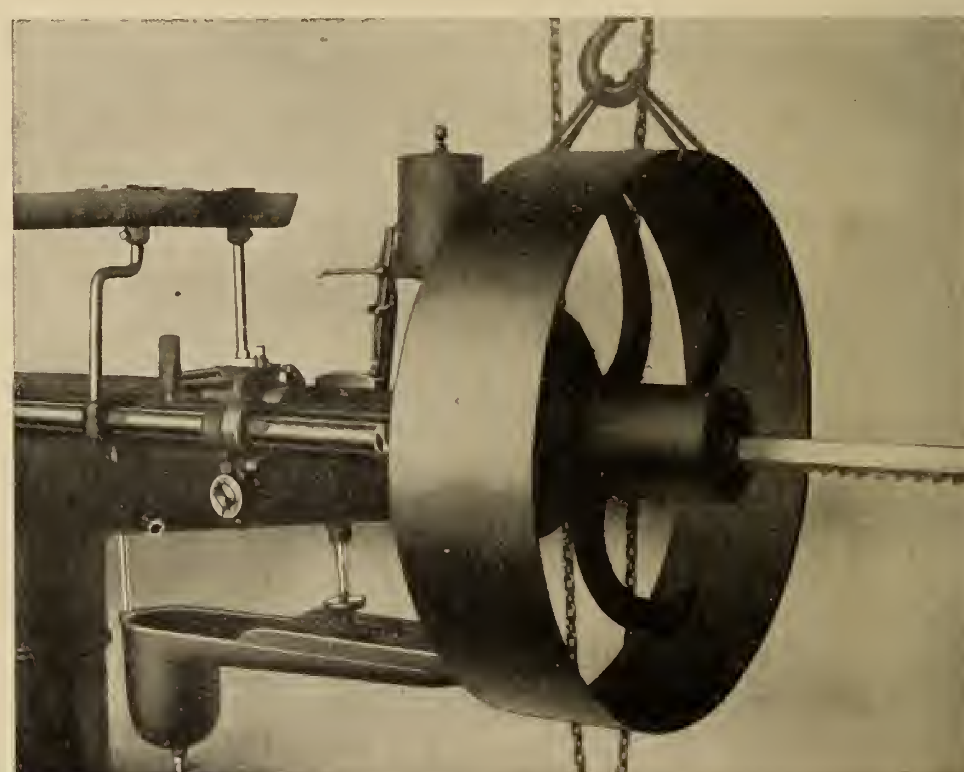
WE MAKE THEM FROM 1" to 6" OR LARGER



With solid shank or shell style. Will send one on trial.

Lapointe Mach. Tool Co.

HUDSON, MASS.



BROACHING is the only way to make Square, Hexagon, Octagon, Oblong or any old shaped hole, and also cut keyways in holes. Write us.

LAPOINTE MACHINE TOOL CO., - HUDSON, MASS.

MACHINERY FOR SALE

LATHES

One new 32"x16' New Haven. (triple geared).
One refitted 30"x14' back-geared.
One new 28"x16' New Haven.
One nearly new 25"x14' Sarnia.
One new 24"x16' New Haven.
One nearly new 24"x16' London.
One refitted 23"x10' Perkins.
One new 22"x12' Lodge & Shipley. (double back-geared).
One new 22"x12' Lodge & Shipley.
One new 19"x8' Greaves Klusman.
One new 19"x10' Greaves Klusman.
One nearly new 19"x12' Rahn-Carpenter.
Two new 18"x8' Rahn-Carpenter.
One refitted 18"x8' London.
One refitted 18"x6' back geared.
One new 17"x8' Rahn Carpenter.
One new 16"x10' Rahn Carpenter.
Two new 16"x8' Lodge & Shipley. (patent head).
One refitted 16"x6' Gardner.
One new 16"x6' Rahn Carpenter.
One new 15"x6' London.
One new 15"x6' Sebastian.
One new 14"x6' Sebastian.
One nearly new 13"x6' Seneca Falls.
One refitted 13"x4' 6" back geared.
One refitted 12"x8' back geared.
One new 10"x72" Sebastian.
One nearly new 9"x57" Barnes.
One refitted 9"x40" Sebastian.
One nearly new 24"x40"x18' London Gap.
One nearly new 24"x40"12' London Gap.
One new 18"x25"x12' Rahn Carpenter Gap.
One new 24" Gisholt turret lathe.

IRON PLANERS

One refitted 30"x30"x8' Dundas.
One refitted 28"x28"x7' Gibson.
One nearly new 24"x24"x6½' London.
One refitted 24"x24"x36" American.
One 23"x18"x5' in good order.
One 13"x15"x12" hand planer.
One refitted 12"x12"x27" complete.
One refitted 12"x9"x30" hand planer.

IRON SHAPERS

One new 15"x48" open-side Cincinnati.
One new 15"x30" open-side Cincinnati.
One new 32" B.G. Cincinnati.
Three new 24" B.G. Rockford.
One nearly new 24" B.G. Sarnia.
One new 20" B.G. Rockford.
One new 16" B.G. Steptoe.
One new 16" B.G. Rockford.
One new 16" B.G. Cincinnati.
One rebuilt 12" Fitchburg.
One refitted 9" gear-driven.
One new 7" Rhodes hand or power.

DRILLS

One New 36" Cincinnati.
One refitted 36" B.G. hand-feed.
Two new 32" Mechanics.
One refitted 28" B.G. power-feed.
Two new 28" B.G. Kern.
Three new 26" B.G. Mechanics.
One new 25" B.G. Kern.
One new 24" B.G. Mechanics.
Two new 24" B.G. Cincinnati.
One new 24" B.G. Cincinnati. (with tapping attachment).
Two refitted 22" sq. base, hand-feed.
Eleven new 20" B.G. power-feed.
Two new 20" Mechanics power-feed.
One new 20" Mechanics W.&L. feed.
Three new 20" Mechanics friction.
One refitted 20" Lodge & Davis.
One nearly new 20" Silver.
Three new 16" lever-feed, sensitive.
Two new Knight drills and millers. (combined).
One refitted 15", 2-spindle sensitive.
Two new 14" Mechanics.
One new 13" Reed sensitive.
Two new No. 13 hand drills.

MILLING MACHINES

One new No. 2 plain Cincinnati.
One refitted 24" Bertram.
One 27"x6"x13" Branard Lincoln.
Two new No. 3½ Fox, hand and power feed.
Two new No. 3 Fox, hand and power feed.
Two new No. 2 Fox, hand-feed.
One Garvin hand miller.

BOLT and PIPE MACHINES

One new 2" National bolt cutter.
One refitted 2" bolt cutter.
One nearly new 1" Acme bolt cutter.
One refitted ½" bolt-threading machine.
One new 1" to 4" McDougall pipe machine.
One nearly new ¼" to 2" Williams pipe machine.
One ¼" to 2" Borden hand pipe machine.
One 2" hand or power pipe machine.
One 2½" to 5" Curtis pipe machine.

POWER PRESSES

One new No. 21 power press.
Four new No. 20 power presses.
Six new No. 19 power presses.
Five new No. 18 power presses.
One No. 2 Fowler's patent power press.
One No. 2 Stiles & Parker power press.
One stamping press, 5" stroke.
One punching press, 1" stroke.
One French double-head power press.
One light punching press ⅞" stroke.

GRINDERS

One new cutter and reamer grinder.
One new Universal tool grinder.
One new Cincinnati grinder.
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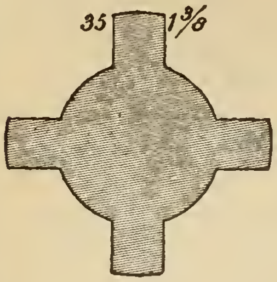

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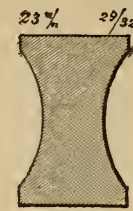

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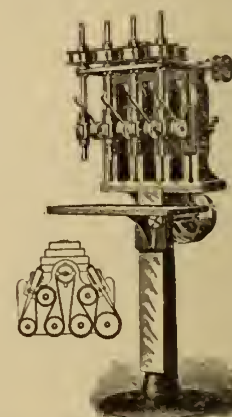

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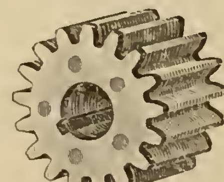

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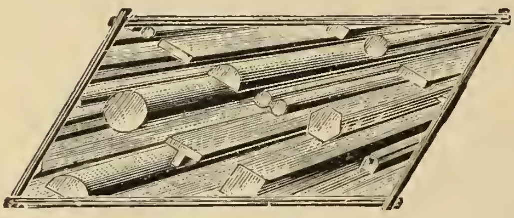

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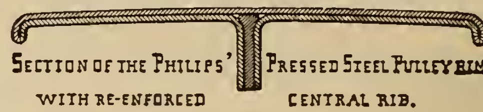

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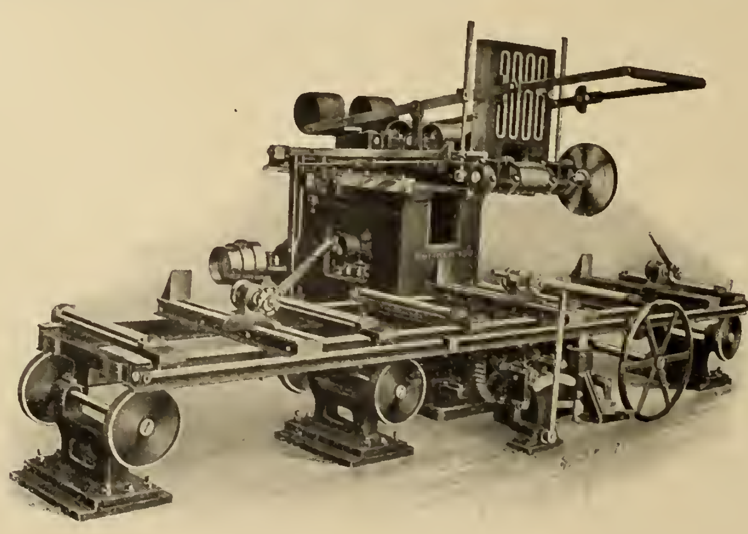

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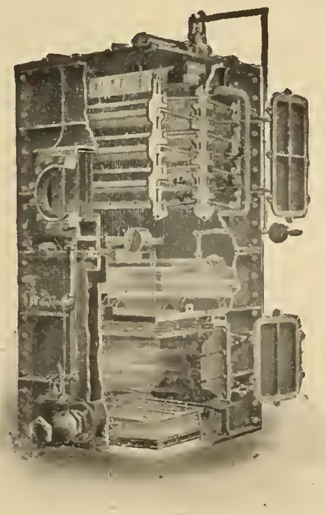

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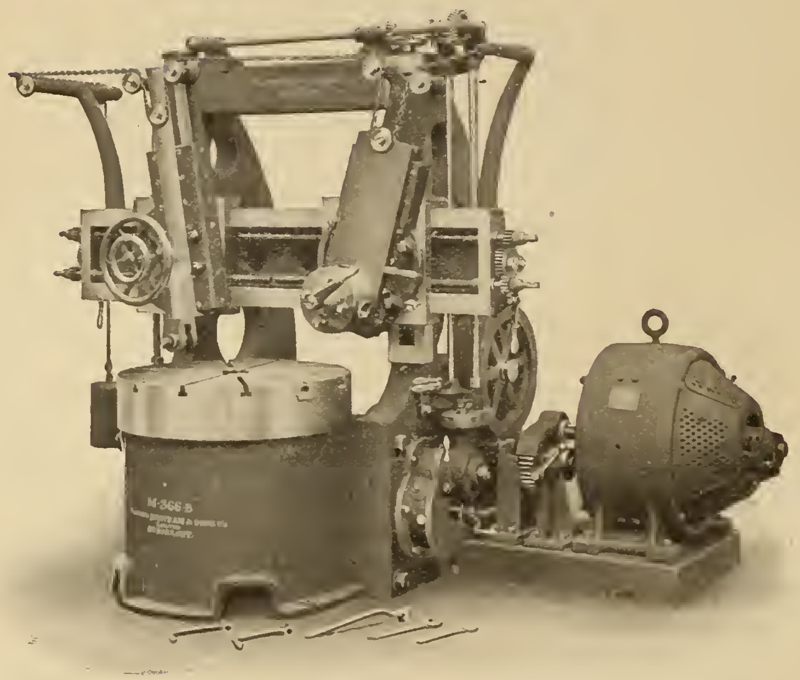

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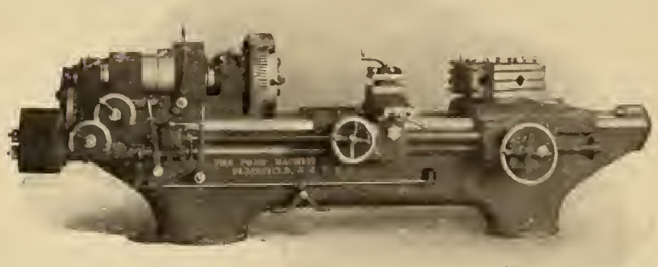

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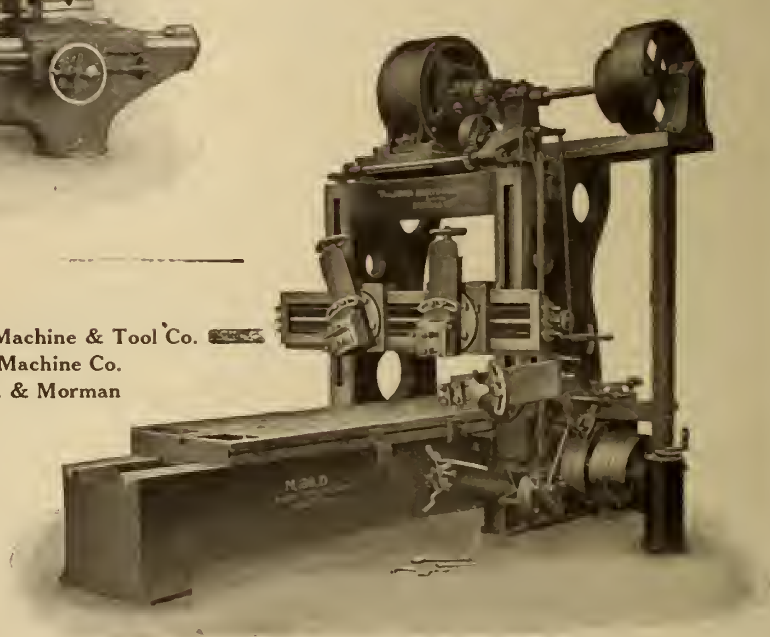

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Some Jigs and Devices Used in Canadian Railway Shops

Jigs for Valve Stem Packing, Patch Bolts, Removing Piston Rods, Removing Studs, Cutting Flue Sheets, Turning Crank Pins, Making Air Pump Rings, Machining Axle Boxes, Boring Driving Box Brasses, Etc.

By JOHN T. SUMMER * and ONLOOKER **

Jig for Machining Valve Stem Packing.

In Figs. 1 and 2 is shown a jig used in the Michigan Central shops in St. Thomas for turning valve steam packing. A set of this packing is shown at K., Fig. 1 and 2. The packing will be followed from the molding room to the finished packing.

There is a special jig for molding the cylinder M, Fig. 1, from which the packing is formed. This is shown in Fig. 3, which fully explains itself.

The cylinder of metal comes to the machine shop, and is bored to the correct size in a turret lathe. Then the jig comes into play. The cylinder is clutched in a turret lathe and the jig placed in the turret as shown in Fig. 1. L, Fig. 1, is to hold the cylinder firm, while the operations are being performed. With the cutter E, the packing is turned to shape; and with the dividing tools G M C the packing is cut off. At E, Fig. 2, it will be seen that provision has been made in the forming cutter for the metal removed by the dividing tools. This tool is also let into the sliding piece B, as shown in Fig. 2. This is to protect the corner of the forming tool and to ensure correct shape.

These operations are done consecutively by means of the lever H, which operates the slide B backwards and forwards, which brings up the forming tool E with the holder D, to the cylinder, and after it does its work, the holder C with the parting tools.

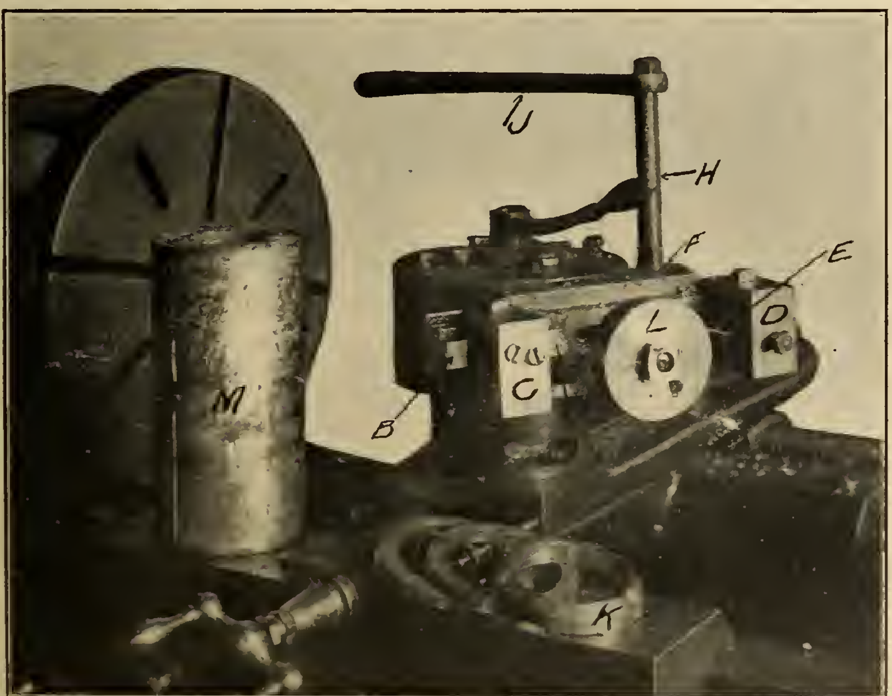

Fig. 1—Jig for Producing Sets of Valve Stem Packing.

(For convenience in photographing this turret was removed from the turret lathe and placed on the tool room lathe.)

This completes one set of packing. Several sets of packing are cut from the one cylinder in this way.

The working time taken to completely machine one set of packing from the bored cylinder is on an average one minute. The time required to bore the cylinder must be divided among the number of sets obtained from one cylinder. All this is done with one chucking of the cylinder. The small piece of the cylinder which remains in the jaws of the chuck, goes back to the molding room.

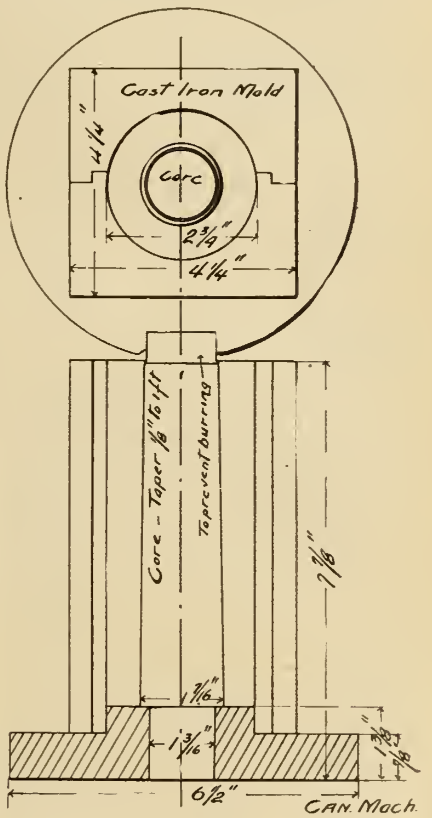

Fig. 3—Mold for Metallic Cylinder from which Sets of Valve Stem Packing is Formed.

The jig with dimensions as in Fig. 2, is for making the size of packing shown at K, Fig. 2. Fig. 3 is a sketch of the mold used for the size of cylinder, shown at M, Fig. 1, from which packing K, Fig. 1, is cut. The parts of the jig can be easily picked out by reference to the figures.

Jig for Making Patch Bolts.

In Figs. 4 and 5 is shown a jig for machining patch bolts, as used in the Michigan Central Railway shops at St. Thomas. (This jig was placed on the lathe shown merely for convenience in photographing). Here, of course, the forged bolts with the square heads are used. In some railway shops these bolts are now cut and machined from the bar in an automatic machine.

At A, Fig. 5, is shown the chuck for

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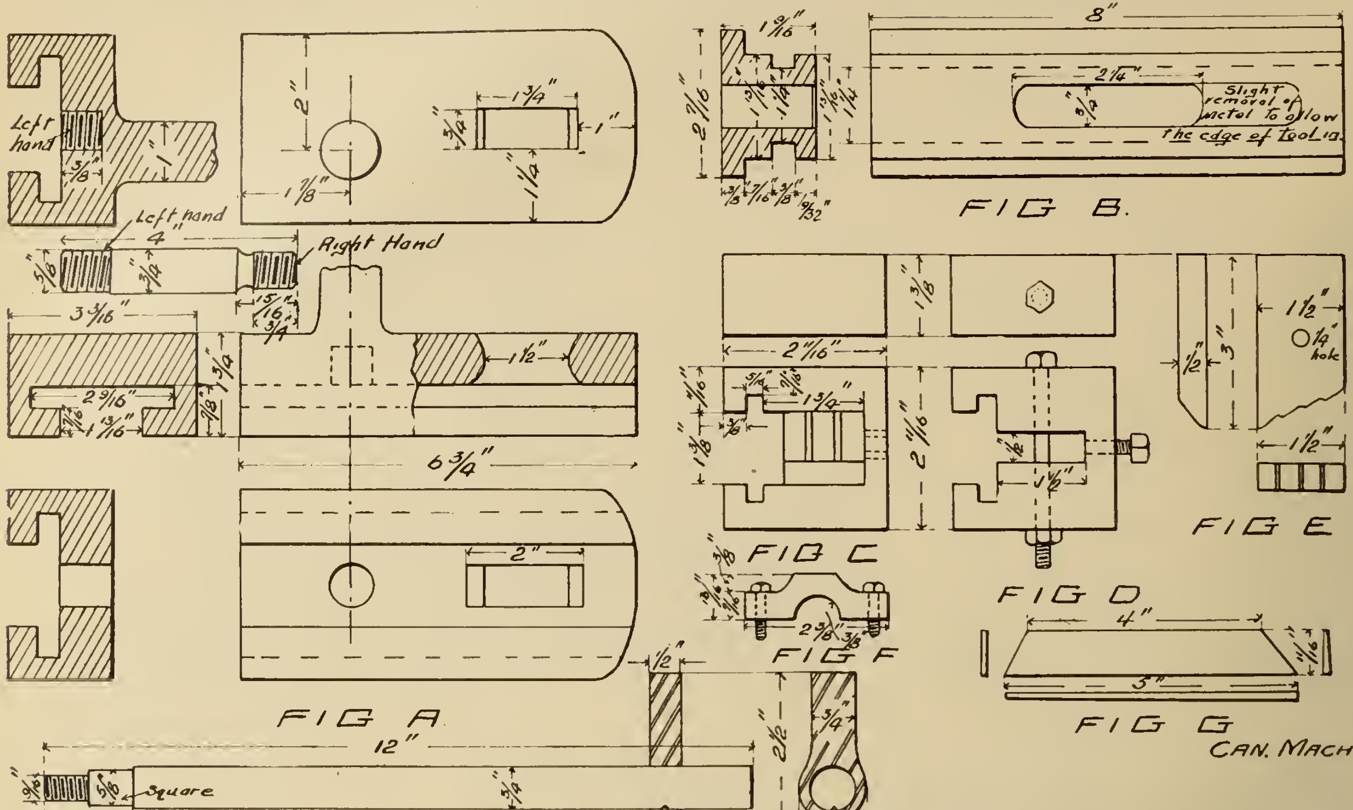
* Foreman of tool room in M.C.R. shops in St. Thomas, who got up the jigs spoken of as in use in M.C.R. shops.

** One of the editors of Canadian Machinery.



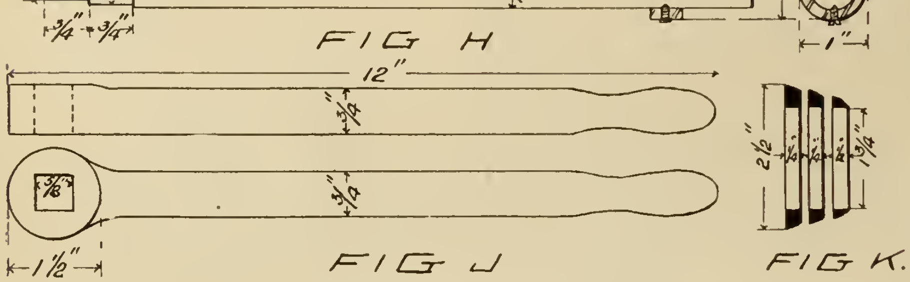


Fig. 2—Details of Jig for Producing Sets of Valve Stem Packing.

holding the bolt. This chuck screws on to the lathe. The patch bolt is finished in three operations, performed in succession by the turret tools B, D and C, Figs. 4 and 5. Some of the finished bolts are shown in Fig. 4. The construction of these three tools is shown clearly in Fig. 5. Tool B is for turning and forming the lower side of the head; D is for forming upper part of head, and grooving the head sufficiently for knocking off after the bolt has been used; C is for threading.

Before this jig was adopted in the shop, patch bolts required four different operations in the machine shop, and were done on four lathes with four apprentices as operators. Now it is all done on one lathe by one operator. The cost of machining used to be about 3c each; but by means of this jig this cost has been cut down to about 1c. From 28 to 30 bolts can be turned out in an hour with this jig.

Hydrostatic Jack for Removing Piston Rods.

In Fig. 6 is shown a hydrostatic jack for removing piston rods from crossheads used in the Grand Trunk Railway shops. This method of removing piston rods is in more or less common use in railroad shops, having taken the place in many shops of the old wedge method. But in many shops the wedge method is still the popular one. The necessary parts for the latter method as used in the G.T.R. shops are shown in Fig. 7.

The manner of using this hydrostatic jack is apparent from the figure. It is placed over the crosshead pin, and the small piston in the head of the jack is forced against the end of the piston rod by means of the screw, thus driving the piston rod out. With certain styles of crosshead the hydrostatic jack is the only one which can be used.

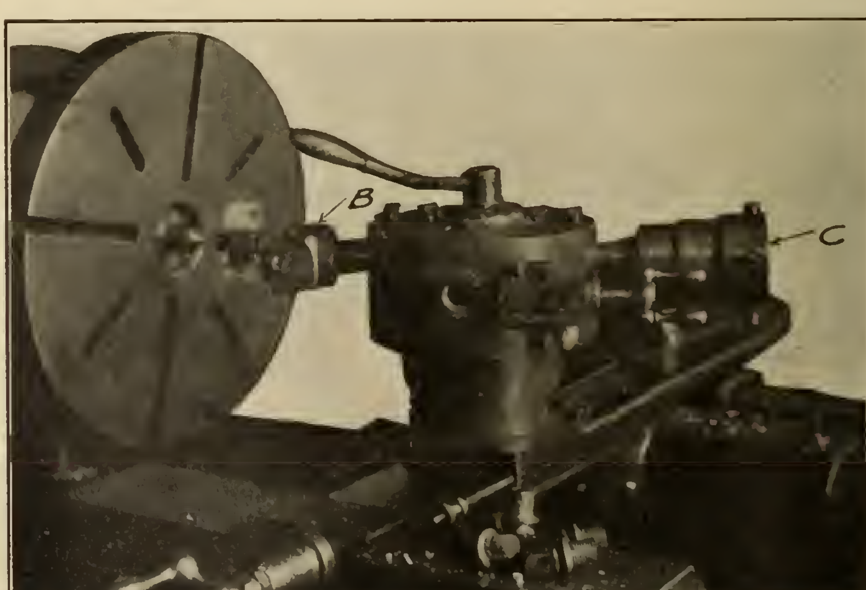


Fig. 4—Jig for Making Patch Bolts.

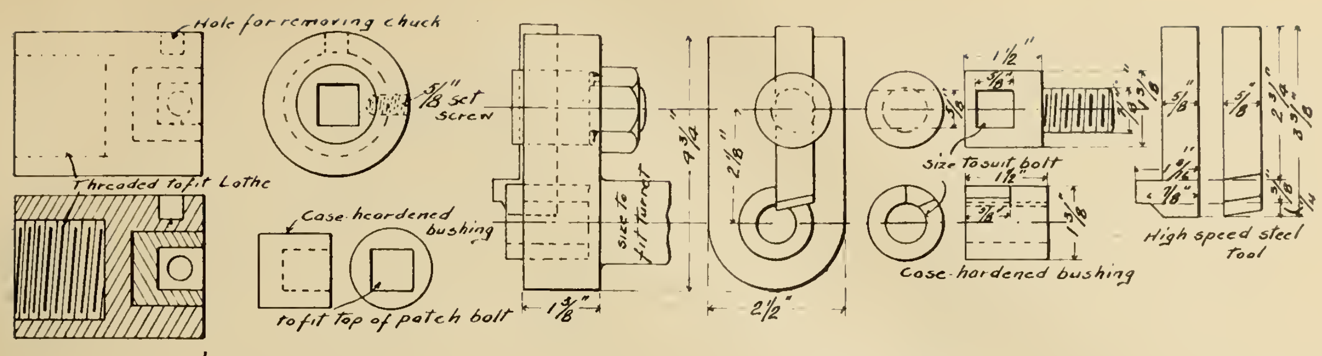


FIG. A. FIG. B.

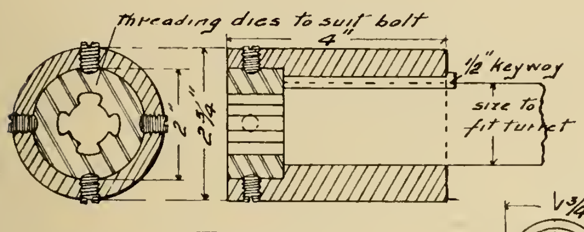


FIG. C.

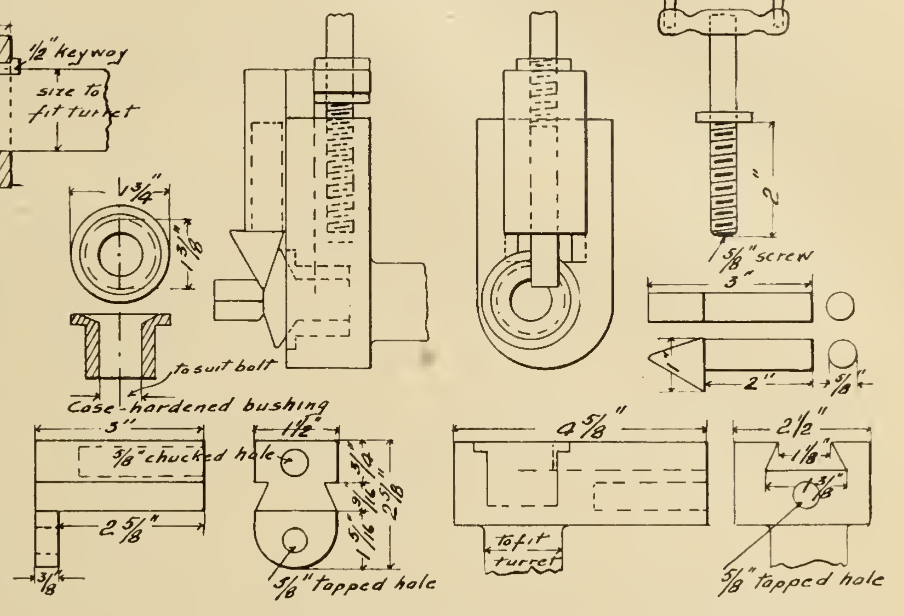


FIG. D.

Fig. 5—Details of Jig for Making Patch Bolts.

The advantages of the hydrostatic jack is its convenience in handling, but it has the disadvantage of having to be more carefully handled than the wedge and requiring repairing occasionally.

In the Michigan Central shops in St. Thomas a hydrostatic jack similar in principal, but of somewhat different construction, is used constantly.

Rotary Air Motor.

The air motor shown in Fig. 8 was gotten up in the St. Thomas shops of the Michigan Central Railway to operate a small saw and emery wheel, the arrangement for which is shown in the figure. The motor consists, as is seen from the illustration, of a cylinder and a drum. The drum revolves eccentric from the cylinder, the cylinder being divided into three chambers by blades The faces of the cylinder carry the bear- operating as shown in the illustration. ings for the shaft containing the drum. A careful examination of the figure will show the operation of the motor and the detail construction.

A feature of the blades should be noted, namely, that they are held

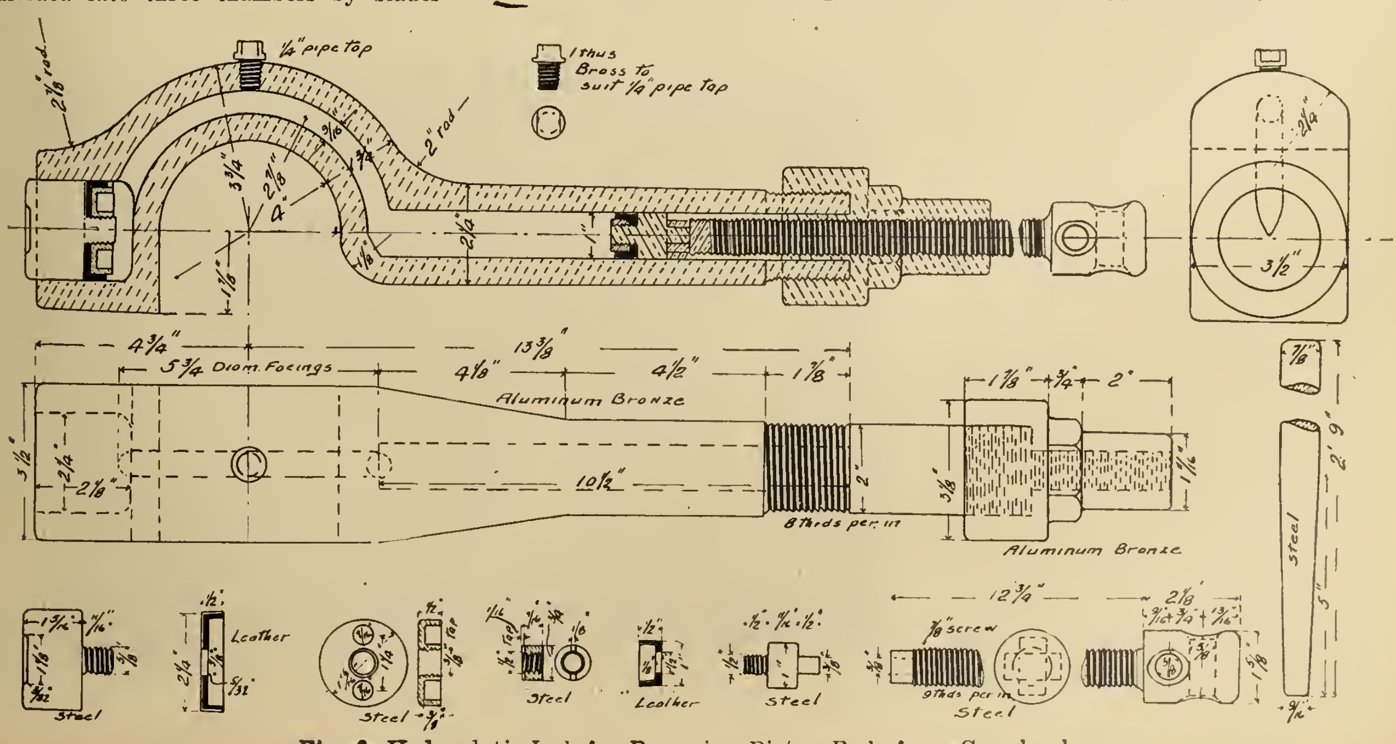


Fig. 6—Hydrosdatic Jack for Removing Piston Rods from Crosshead.

against the sides of the cylinder by air pressure, provision in the blade and in one of the cylinder faces being made.

This principle is envolved in several rotary steam engines, now on the market or which are being experimented with. It should be noted that the drum acts as a crank, and the resultant pressure on this drum acting as a crank is at right angles to the motion of the drum, as in an ordinary crank. The duty of the blades is merely to divide the cylinder into three chambers and prevent leakage of air from one chamber to another.

In Fig. 9 is shown a jig which is used to good effect in the Michigan Central Railway shops in St. Thomas for removing studs. With this jig one can get a grip which will not let go until the stud is loosened up and removed.

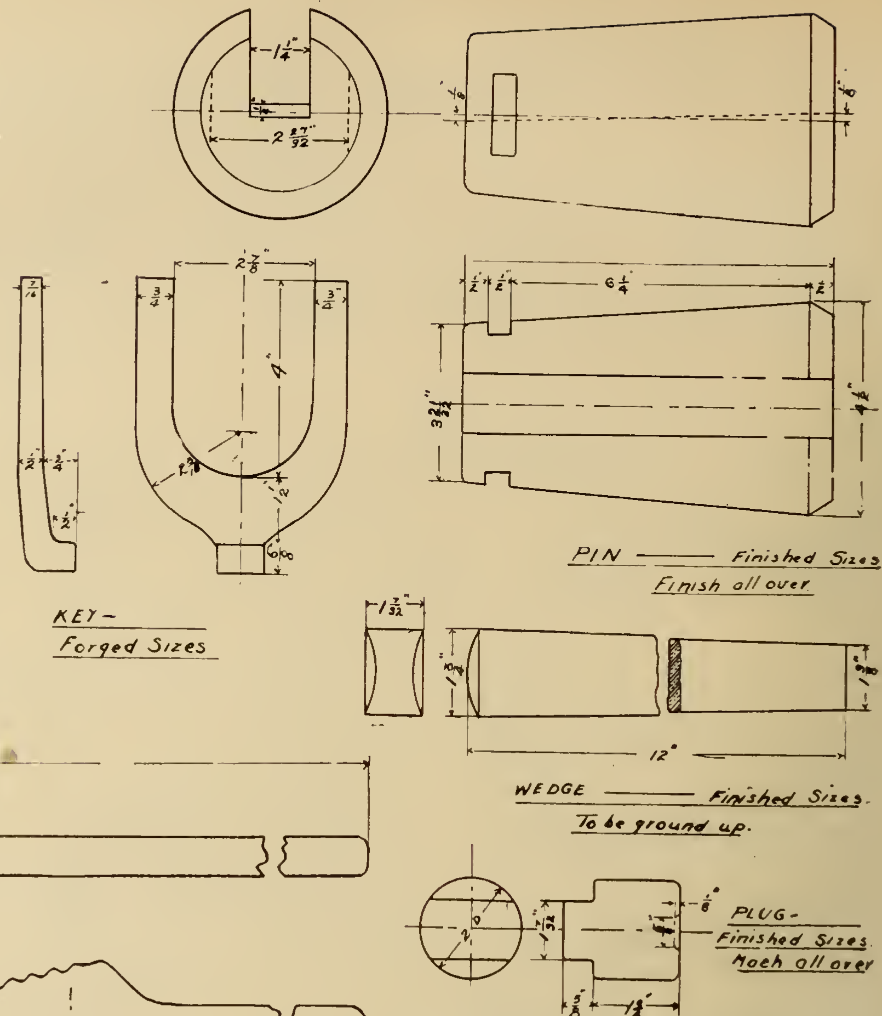


Fig. 7—Details of Wedge Jig for Removing Piston Rods from Crossheads.

Flue Sheet Cutter.

A flue sheet cutter is shown in Fig. 10, which does excellent work in the M.C.R. shops in St. Thomas. It is used in a

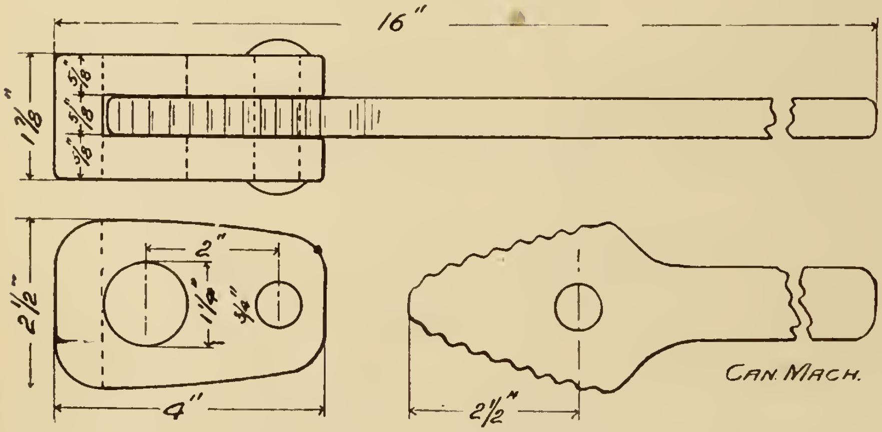


Fig. 9—Jig for Removing Studs.

heavy Pond drill, and will cut a flue sheet at the rate of one every thirty-five seconds. The flutes on the end of the cutter are to ream out the punched hole, thus providing a good guide. Each hole when drilled with this cutter costs about ⅝c for labor. The drawing explains itself.

Portable Crank Pin Turning Machine.

The Grand Trunk Railway have gotten up several portable machines for turning crank pins, the best of them, and the one which is mostly used, being shown in Fig. 11.

Inasmuch as the outside end of a locomotive crank pin, from which projects the gudgeon screw, never becomes altered in shape from wear, it follows that if a machine of a suitable character be attached to the screw, and facing truly against the end just refererd to, the surface of the crank pin, which through use has become altered in form, can easily be restored to its original shape and quarter.

The accompanying photograph shows such a machine attached to the pin and ready for operation. The manner in

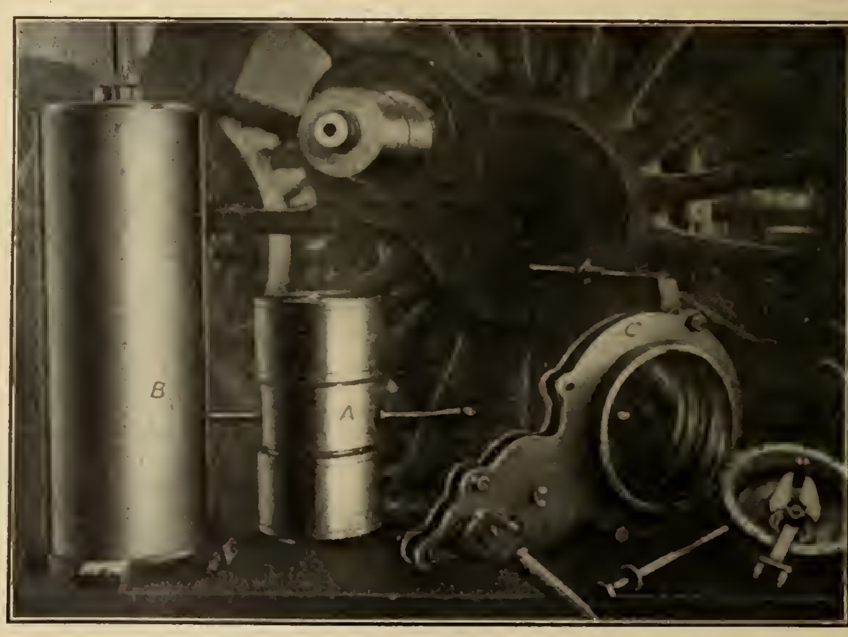


Fig. 11—A Portable Crank-Pin Turning Machine.

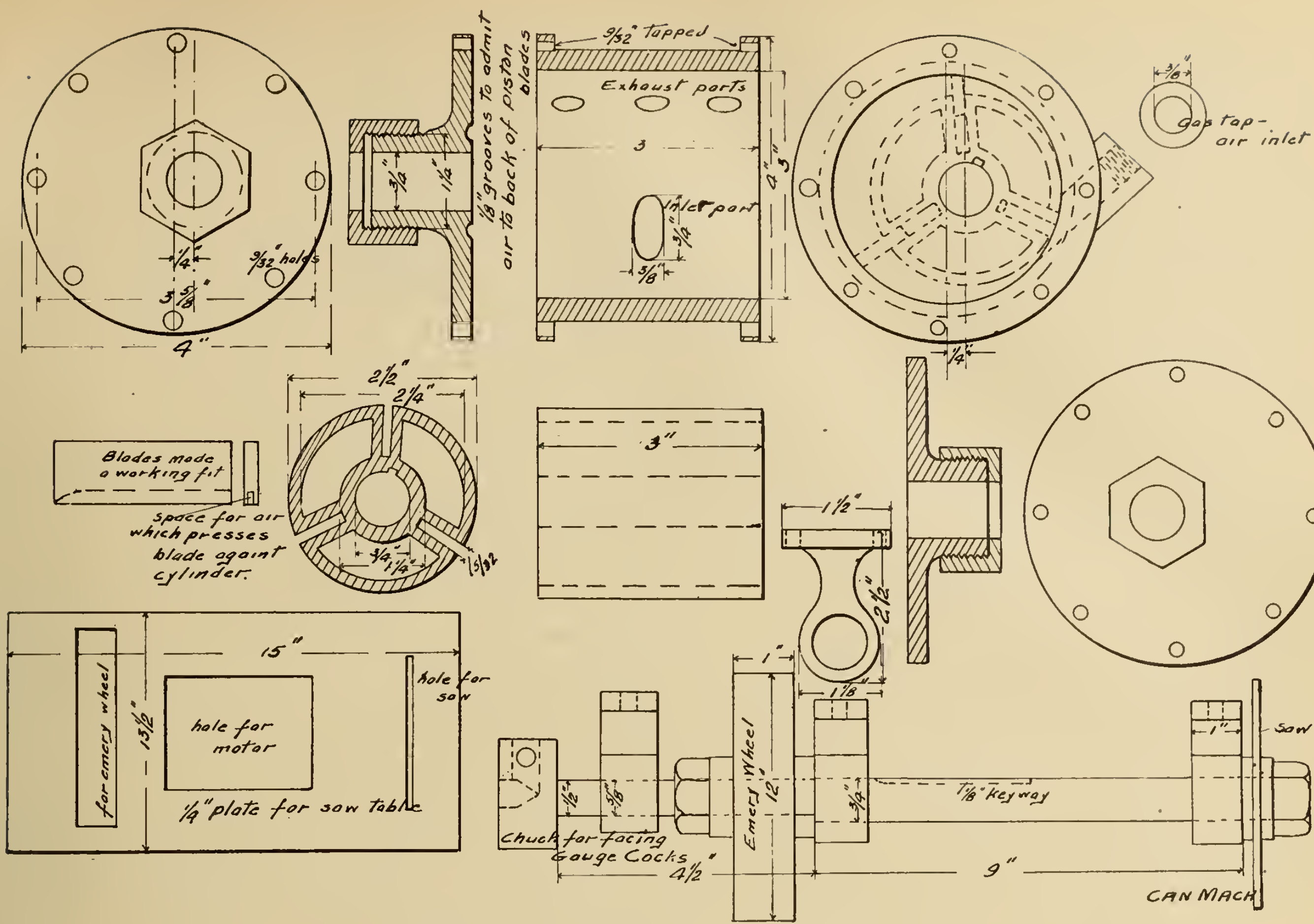


Fig. 8—An Air-Motor used in M.C.R. Shops.

which this machine performs the work is as follows:

After screwing the machine A firmly to the end of the crank pin by means of the two handles, the latter are removed and the sliding sleeve B is placed on the barrel. Attached to this sleeve are four lugs, containing the necessary tools for roughing, finishing and filleting the crank pin. The tools are of 5/8-inch round high-speed steel. The gear wheel and casing C are then slipped over the two feather keys, when by means of an air motor the sleeve is caused to revolve around the crank pin.

The forward or feeding motion of the sleeve is accomplished through mechanism contained in a hand wheel, which feeding is either automatic, or by hand, according as the gearing is engaged or disengaged. It is not necessary to stop the motor to throw the feed in or out. Provision has been made for any lost motion from ordinary wear and tear of the barrel and sleeve, by adjustable rings, which are screwed against taper split bushings on each end.

The machine consists of four parts, no one of which is too heavy to be handled by even a boy. This crank-pin turner can be adjusted to any pin having a threaded end by simply making a face plate to suit the pin, and threading it to fit the extension.

The largest locomotive crank pin can be re-turned to shape in three hours. A great saving of time is thus effected, as compared with the practice generally in vogue of removing and turning or of fil-

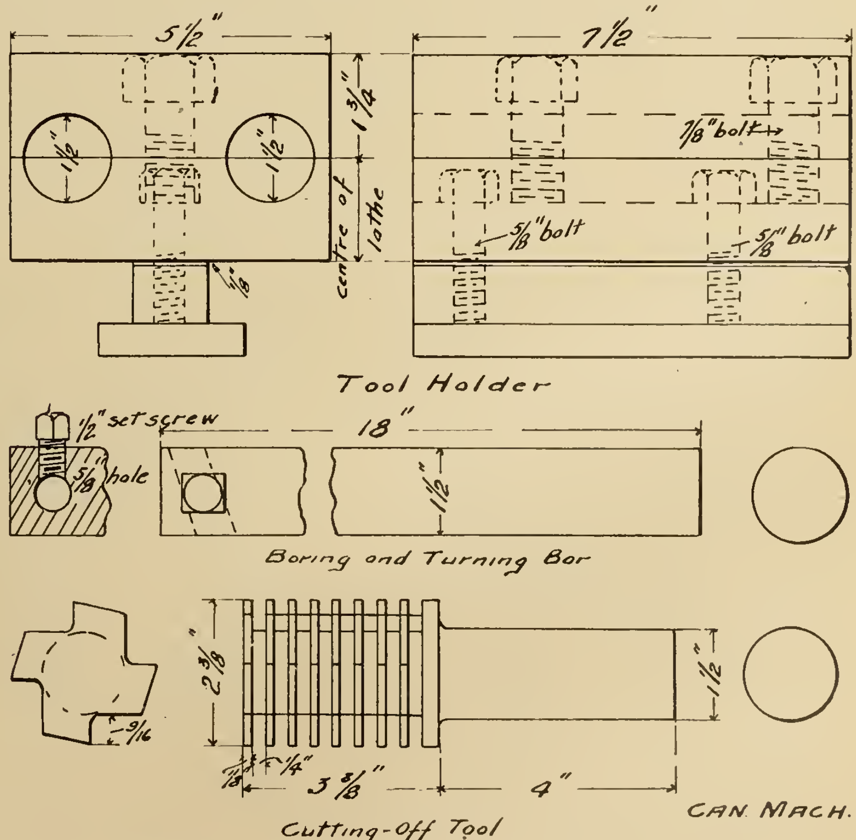


Fig. 12—Jig and Tool for Air Pump Rings.

ing the pin. It can be used in any roundhouse without removing the wheels from the engine, and is successfully operated with 70 pounds air pressure through an air motor.

As a result of several years' observation, it has been ascertained that providing the main pins are maintained in a "true" condition, those in the front and back wheels require little or no attention. The number of rod breakages will materially be lessened, and the brasses will give a far greater mileage.

Another type of portable crank pin turning device was gotten up by the

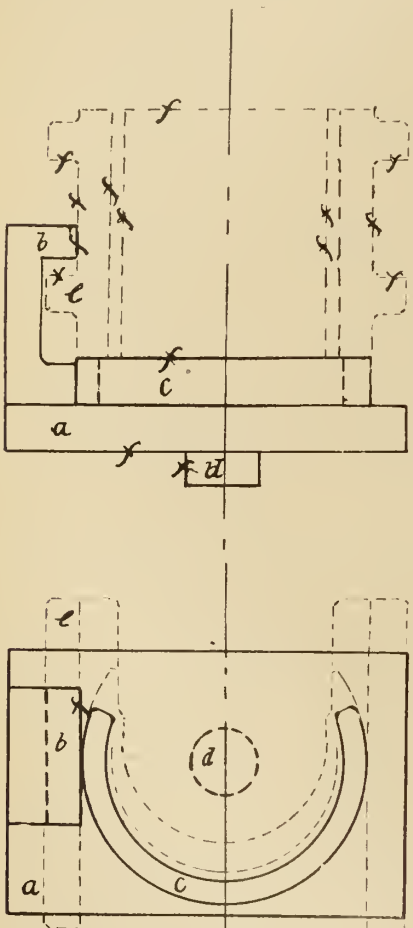


Fig. 17—Machining Locomotive Axle Boxes.

Grand Trunk, but did not come into general use. This was a much simpler device, and was designed to be operated by hand, but could be operated by air motor. This consists of a bracket and table which was bolted to the wheel. On this table is bolted a bracket parallel with the face of the wheel, which holds a gear and pinion meshing with each other. The gear has a centre which is centered with the crank pin. To the gear is fastened an arm projecting over the crank pin and holding the tool. Power is applied to the pinion causing the gear to revolve carrying the tool around the crank pin. A device for feeding is provided.

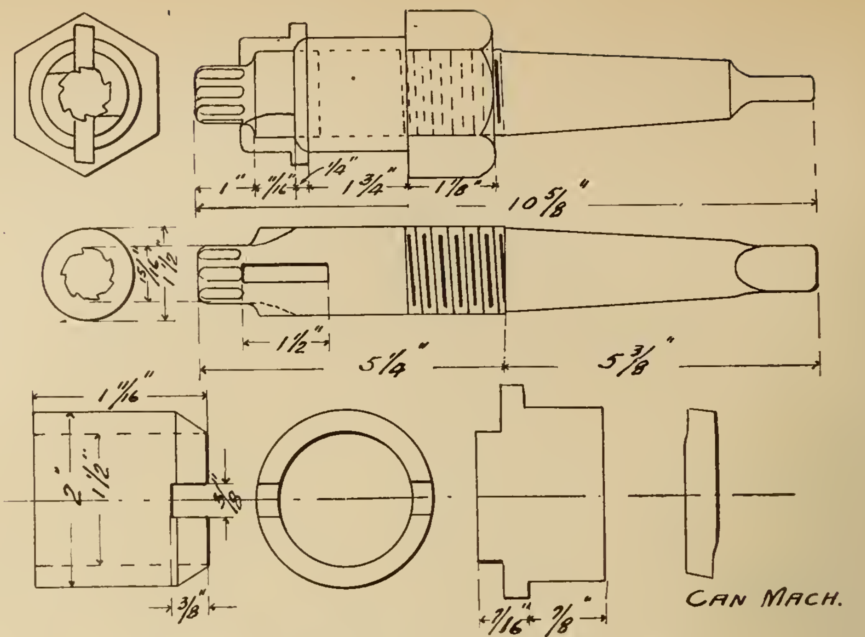
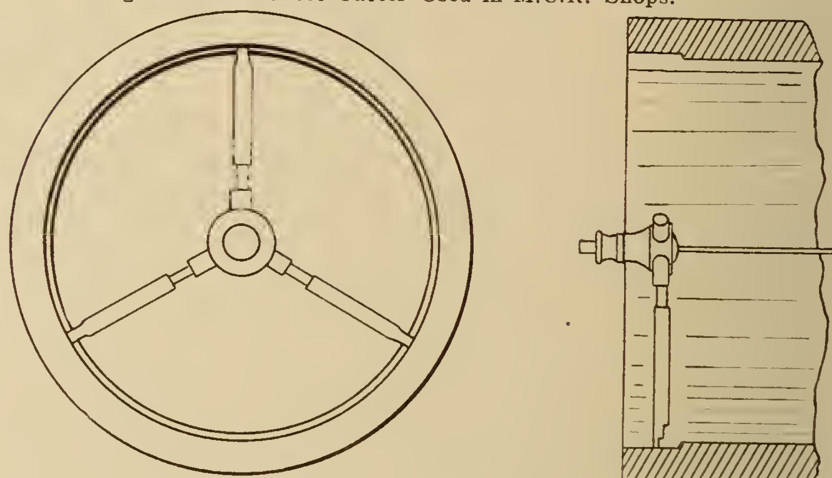
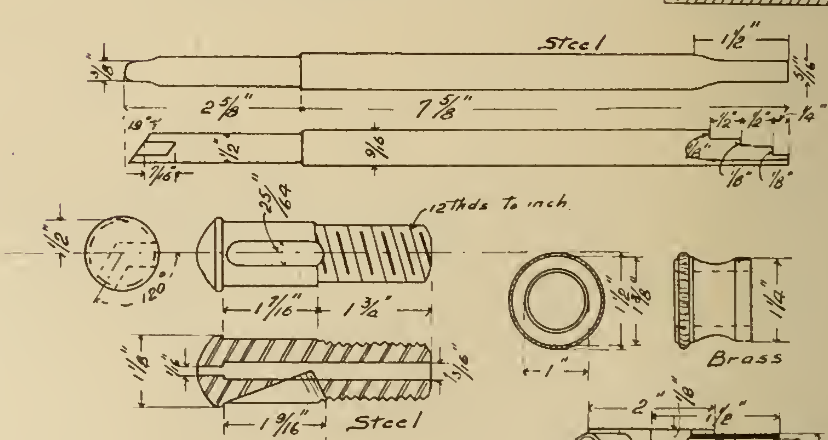


Fig. 10.—Flue Sheet Cutter Used in M.C.R. Shops.





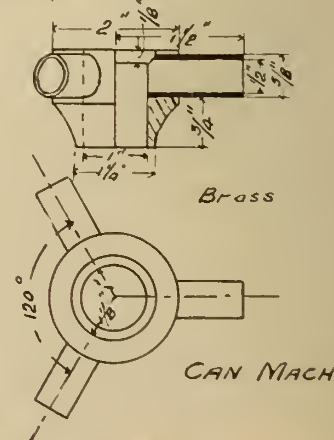


Fig. 13—Jig for Centering Cylinders.

Turning and Cutting-off Air Pump Rings.

In the M.C.R. shops in St. Thomas a method of producing air pump rings is used which gives excellent satisfaction and is a time saver. The cylinder is cast and from this cylinder the rings are pro-

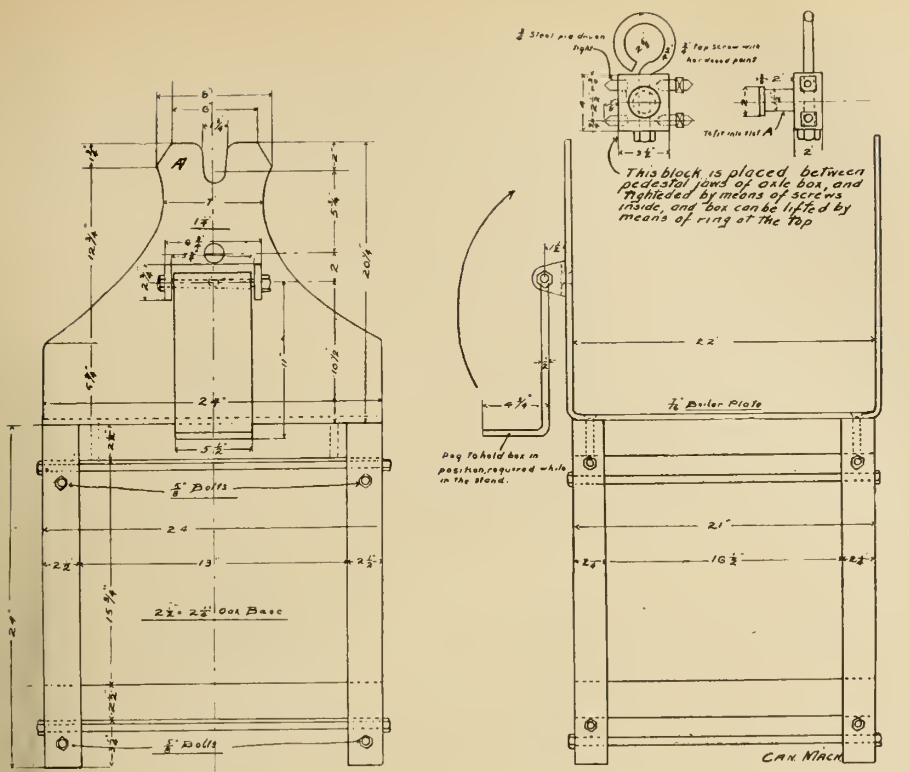


Fig. 14—Jig for Lifting and Holding L ocomotive Axle Boxes in Position for Filing, etc.

duced in the following way. A tool holder for the lathe is made, as in Fig. 12, which is like a turret. The cylinder is chucked in the lathe, and is turned and bored at the same time with boring bars as in Fig. 12. These bars are held in the holes in the tool holder, and are parallel, one on the inside and one on the outside of the cylinder. The cylinder being finished to the correct size, the rings are cut off with the tool shown in Fig. 12. This tool is made of cast steel.

Jig for Centering Cylinders.

Very often there is considerable labor in centering up cylinders for boring. A jig is used in M.C.R. shops in St. Thomas, which lessens this work very considerably. The jig and its application is illustrated in Fig. 13. The jig is placed between centres, and acts as a guide for the blocking up of the cylinder perfectly central. The detail construction of the jig is shown in the sketch.

Jig for Lifting and Holding Locomotive Axle Boxes for Filing and Tooling.

In Fig. 14 is illustrated a jig for removing locomotive axle boxes, and holding them while they are filed and otherwise tooled. The notes on the drawing explain the action of the jig fairly well. The note in the upper right-hand corner of the drawing explains how the axle box is lifted from the journal by means

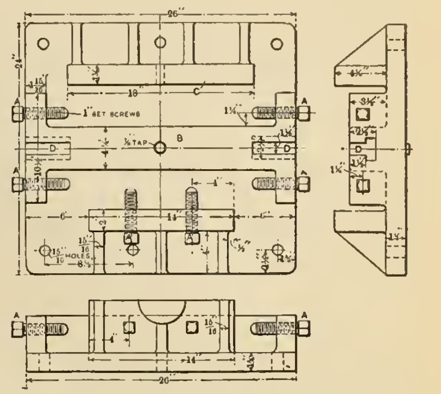


Fig. 18—Jig for Holding Driving Boxes While Brasses are Bored.

of two blocks, the detail construction of one of which is given, and dropped into the slots of the stand. It is then wrong side up for filing, but upon being turned around on the trunnions in the slots and locked in that position by the dog at the side being turned up, as indicated by the arrow, and being made to fall into position against the block. Then the axle box is in a position to be filed and otherwise fixed. Upon completing the necessary operations, the dog can be dropped, and the axle box allowed to swing around until it is in the correct position to be lifted and again placed on the journal.

This jig is used in the Grand Trunk shops, and an air lift is made specially to do this lifting. It is in the form of a column with an overhanging arm. In the column is an air cylinder, the mo-

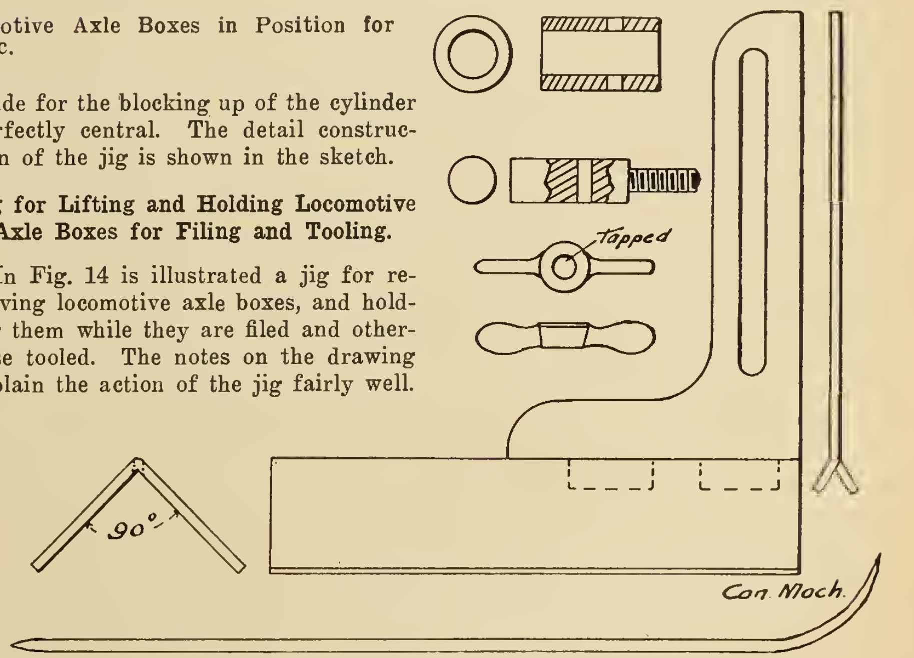


Fig. 15—Jig for Centering Boring Bar.

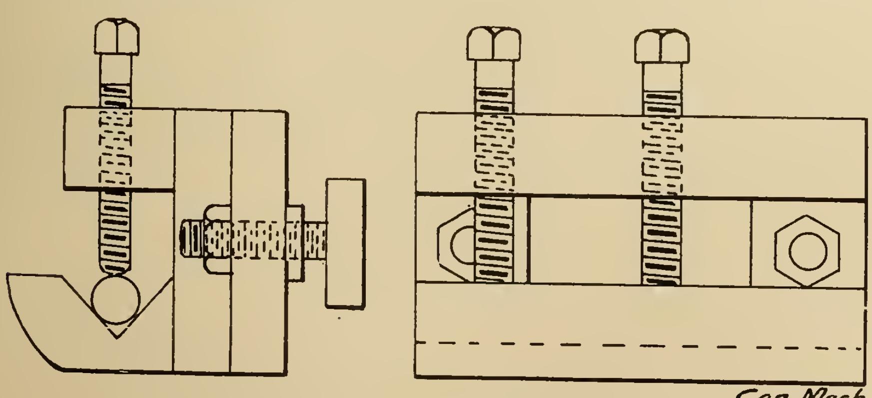


Fig. 16—A Convenient Tool Holder.

tion of which is transmitted to the end of the arm with block and tackle.

Two Useful Tools.

Figs. 15 and 16 illustrate two very convenient appliances used in the M.C.R. shops in St. Thomas. Fig. 15 is a tool for centering a boring bar in a cylinder. It is quite apparent how it is used, and forms a companion jig to the jig for centering cylinders, previously described. Fig. 16 is a convenient tool holder, the tool being quickly adjusted and held in position.

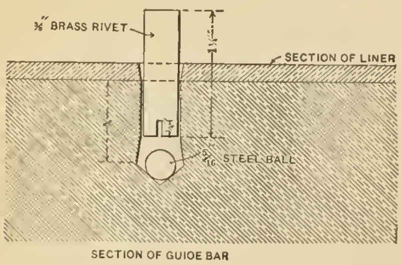


Fig. 20—Lining Locomotive Guide Bars for Lateral Wear.

Machining Locomotive Axle Boxes.

The machining of locomotive axle boxes is a job that is done in many different ways with varying success as to speed and accuracy; but the following method will be found to give good results. Perform the operations in the following order:

1. Rough and finish face, inner end (box will set up on this end for all further operations).
2. Rough face to 1-32 inch, outer end.
3. Lay off for slotting.
4. Slot for brass and oil cellar.
5. Plane for shoe.

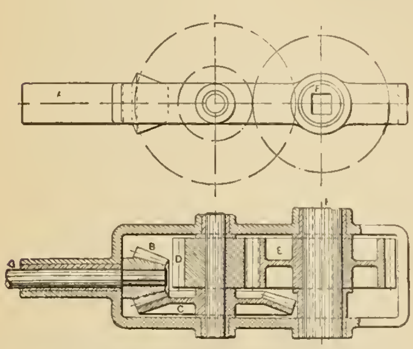


Fig. 19—Right-hand Power Head for Drilling and Reaming.

6. Press in brass.
7. Bore and face brass and finish facing outer end.

Although the drawing may not call for facing inner end of box, it pays to do so, as it makes it so much easier to perform the other operations. As it is very important that the distance from centre of tearing to the front side of the box be exactly the same on all boxes, it is necessary to bore the boxes on a jig. The accompanying sketch, Fig. 17, shows a jig which will be found to give very good results. The heavy lines show the jig and the light dotted lines the axle in place. "A" is the base of jig and rests on the table of boring mill; "d" is a round boss turned to fit the hole in the centre of the mill table; "C" is a circular piece cast onto the jig for the box to rest on and to raise it high enough for the tool to clear when boring; "b" is a stop for locating the front side of the box for boring and must be high enough to clear "e"; "b" is long enough for straping down. The inside diameter of "c" must be large enough to clear the brass, should it be pressed through the inner side of the box. This jig may be cast all in one piece. Finish where marked f.

A NEW BLACKSMITH'S AIR HAMMER.

By T. Chabot, Sherbrooke.

We find the new air hammer built by the Canadian Rand Company better than the belt driven style in that it is more easily controlled and its range of work is practically unlimited. We use it on all kinds of comparatively light work, i.e., sizes ¼ in. to 2 in., round or square. It is used to great advantage on weldings, springs and drawing out ½ in. to 1¼ in. sizes.

It is arranged so that the valve is operated by a treadle, leaving both the operator's hands free to attend to his work.

The principal advantages of the hammer are that the operator can control the blows so very easily, and this with the foot, leaving him free to use chisels, formers, etc., under the hammer, without a helper; the facility of adjusting the hammer to the work in hand, which is done with a few turns of the feed handle; the ability to change the stroke from 8 in. to 1 in. or vice versa, without interrupting the work.

Some of the jobs we keep it busy with are: Drawing out springs, cold chisels, picks, bars, lathe tools, etc., and welding and drawing out stock to 1¼ in. Not least worthy of mention is the space occupied, the hammer being set on a concrete base only 30 in. in diameter.

We are preparing to use it in upsetting and forging bolts in a bolt vise. This will be done by putting a safety clamp under the column clamp, which will permit the hammer to be swung around over the vise for upsetting and back again over the anvil to forge the head to hexagon or square.

The valve movement is the same as the Rand coal shearer, with the same economy of air.

BE PRACTICAL.

No force, however great, no method, however promising, is useful until practicability reduces it to result-bringing.

The practical guided James Watt to the improvement of the steam engine, which wrought revolution in all industry.

Brain power, diffused and impractical, is the resultless self-wearing of a wild

A New Blacksmith's Air Hammer.

engine; centralized, practical, it becomes the motive power of progress.

Fire, soaring red in a frenzy of liberty, is an element of destruction; confined and controlled, a force of production.

The practical develops inertia into energy, adapts ideas to actualities, transforms hopes to efforts, tempers ambition to judgment. It initiates the sanest, utilizes the most effective, develops the greatest results. It wins.

Be practical!—System.

History and Development of Alloys for Railroad Bearings*

Influences Causing the Development; Records of Experiments Performed by Several Investigators; Composition of Standard Alloys

By G. H. CLAMER

In the earliest days of railroading, the alloys used for bearings were those which had been adopted in general machine construction; the favorite alloy seemed to be copper and tin. This alloy was adopted, not because it had any particular merits which were proven, but because it had given satisfactory results on stationary engines, etc., and this was all that was apparently known about it. Then it was about the most expensive combination of the common metals that could be made, which was sufficient endorsement of its excellence.

Furthermore, the prevalent idea in those days was to make an alloy as hard as possible. It was well known that tin, when added to copper, hardened it, and naturally as much tin was added as was possible without making the alloy too brittle. Consequently bearings were made with four parts copper to one part tin, or 80 per cent. copper and 20 per cent. tin (in reality bell metal) and from this on down to nine parts copper to one part tin. Seven parts copper and one part tin for many years was considered the standard of excellence—that is 87½ per cent. copper and 12½ per cent. tin—and is still specified by a few railroads, although these specifications are seldom enforced as the mixture to-day is considered entirely too expensive.

In those days, that is before 1870, the equipment was light, and speeds so slow that almost any kind of bearings would answer. A few hot boxes en route were expected, and a traveler would consider himself fortunate should he reach his destination without detention, due to this cause.

Standard Bearings.

The Railway Master Car Builders' Association in 1872 adopted its first standard design of bearing. Before that time no standard whatever was recognized; each master mechanic or car builder had his own idea as to the design of bearing, and consequently the equipment included bearings of almost every conceivable form. Naturally no interchange was possible, in fact, the interchange was only then becoming necessary because of cars being taken from one road to another. The standard size then adopted was 3¼ by 7 inches. The sizes of the standard axle and journal have been increased from time to time to meet the demand for heavier equipment, and this has necessitated larger journal brasses. The Master Car Builders' Association has adopted a standard brass for each axle size, differing, however, only slightly from the original design. Fully 95 per cent. of the cars built to-day are equipped with bearings of standard design. Cars are to-day sent from coast to coast, operating for months on a foreign road; were it not for the standardization of equipment, cars might be held up for long periods at distant points because the road, in whose custody it is, has not the proper equipment to repair it.

The First Standard Alloy.

The copper and tin alloy, made in the proportion of seven to one, was until 1887 considered the standard alloy for railway bearings. This standard was maintained principally for the reason that the manufacture of railway bearings, for 17 years before that time, had practically been in the hands of one company. This concern in 1870 placed on the market a lead lined bearing. This invention consisted of nothing more than the application to the bearing surface of a thin lining of lead. The lining was applied by first tinning the journal surface of the bearings and then placing it against a mandrel, and pouring as thin a lining as possible of pure lead between the bearing and the mandrel, the molten lead attaching itself firmly to the tinned surface of the bearing. Hopkins thus produced what he called a self-fitting bearing.

Because of the constantly increasing weight and speed of trains about the time of this invention, the bearings were becoming more and more troublesome. The trouble was aggravated by the fact that the bearings were hard and unyielding, and heated rapidly. The lubrication was by no means as satisfactory as it is to-day, and dust-guards were little used. The invention referred to, like many others of the same simple nature, solved the difficulties in a remarkably satisfactory manner, and so evident were its merits that it was almost universally used.

Introduction of Lead and Phosphorus.

Before the expiration of this patent, Dicks, of England, secured a patent covering the introduction of lead and phosphorus into the copper and tin alloy for bearings, claiming that the lead added to its efficiency. This alloy was manufactured by the Phosphor Bronze Smelting Co., and became known as the "S" brand—other alloys, containing phosphorus, having been manufactured for other purposes.

This brand consisted of 80 parts copper, 10 parts tin, 10 parts lead, and 1 part phosphorus, and was adopted by the Pennsylvania railroad as a result of a series of tests, made by Dr. Dudley. He proved what had already been a fairly well founded theory, that the addition of lead to the copper and tin alloy was really of very material benefit. The phosphorus was added for its supposed beneficial influence in the foundry. Phosphorus is a deoxidizing agent and has the property of rendering the metal exceedingly fluid. As a result of his experiments, Dr. Dudley drew up specifications which, so far as I am aware, were the first covering the composition of an alloy for railway bearings. The specification was that of the phosphor bronze "S" bearing metal, and described certain limits for each constituent, and a limitation on impurities. It read as follows:

Copper	78 to 80
Lead	8 to 11
Tin	9 to 11
Phosphorus	7-10 to 1 per cent.

All ingredients foreign to above, not over 1-3 of 1 per cent.

Shortly after the introduction of the phosphor bronze bearing metal, my father commenced the manufacture and sale of metal containing

77 parts copper,
11½ parts tin,
11½ parts lead,

without the use of phosphorus. This was about 1876. After selling this product in a very limited way, he interested the Elkins Mfg. Co., but it was found difficult to introduce. First, because of the prevailing prejudice against anything except copper and tin, this metal being looked upon as a fraud because copper and tin was debased by lead. Second, because of the competition of phosphor bronze "S" brand, which was recognized by the Pennsylvania

* Presented at the annual meeting of the American Society for Testing Materials.

railroad as an alloy of merit, and, third, because the Hopkins lead lined car bearing patent had not yet expired —the bearings of Ajax metal were not sufficiently soft to operate satisfactorily without lead lining. For engine bearings, however, it found favor, and sales increased steadily. In 1880 the manufacture and sale was taken up by the Ajax Metal Co., and the production continually increased. Some years later other manufacturers came into the field.

Dr. Dudley appears to be the first and perhaps the only one, who has actually taken in hand a practical and scientific study of the alloys for railway bearings. During his long connection with the testing department of the Pennsylvania railroad he has had occasion to study practically all the alloys of promising qualities which have from time to time been presented. About 1890 Dr. Dudley conducted tests whereby he compared the copper and tin alloy, which consisted of seven parts copper and one part tin, with the above-mentioned "S" brand phosphor bronze. Without discussing any of the details of these tests, I will simply quote the conclusions which he drew from the data obtained :

First—Phosphor bronze showed less tendency to heat.

Second—Phosphor bronze showed a slower rate of wear.

Third—The phosphorus in the alloy apparently did not affect materially the performance of the bearings in service, and is added only for beneficial influences in the foundry.

Fourth—The superiority of the "S" brand phosphor bronze is therefore due to the lead which it contains.

Having noted the beneficial influences of lead, it became a question as to how much lead should be added, also what relationship the quantity of tin had upon the properties of the alloy. With these questions in mind, further tests were conducted which resulted in the establishment of the following facts :

First—Wear diminished with the increase of lead.

Second—Wear diminished with the diminution of tin.

Third—The tendency to become heated decreases as the lead increases and the tin decreases, or in other words, as the plasticity of the alloy is increased.

Proportions of Tin and Lead.

These facts having been established by numerous tests, a still further problem confronted Dr. Dudley. It being true that the valuable properties of the alloy increased in the direction indicated, how far could the decrease of tin and the increase of lead be extended, and still maintain sufficient compressive strength, so that the bearings would not distort under the loads which they are called upon to carry. The tests he conducted were with percentages of tin from 8 to 12½ per cent., and lead from zero to 15 per cent. None of these alloys showed indication of distortion in service. The alloy 8 per cent. tin, 15 per cent. lead and 77 per cent. copper proved to be the best of the series. To this a small percentage of phosphorus was added (¼ of 1 per cent.) for foundry purposes. This alloy he called E. X. B. metal.

Dr. Dudley, in one bold leap, then tried to make an alloy of 4 per cent. tin, 20 per cent. lead and 76 per cent. copper, but he failed in his attempt to produce a homogeneous alloy of this composition; as he expressed it, "a very funny difficulty was encountered, that is, the lead segregated," and further experiments in this line were abandoned. It is generally believed that lead and copper do not alloy, and can not be made into castings. It is true that lead and copper have a very weak affinity for each other, and this, combined with the great difference in the melting points and specific gravity of the two metals, makes it impossible to get castings which can be said to be really homogeneous, unless they are small, thin sections, which can be rapidly cooled. A copper and lead alloy does not make what would be called good castings, although they may be fairly well mixed; by the introduction of tin, a more homogeneous product is secured.

It was the knowledge of these facts no doubt which led Dr. Dudley to abandon further efforts in the direction of increasing his lead and decreasing his tin beyond the proportions of E. X. B. metal. Why his efforts to make an alloy of 4 per cent. tin, 20 per cent. lead and 76 per cent. copper failed is hard to determine, as the alloy is made with the simplest kind of foundry manipulation. In all probability, when attempting to make this alloy, Dr. Dudley had present some impurity—phosphorus, perhaps—which was detrimental to the best results. Knowing that tin added to the homogeneity of the copper and lead alloy, it was thought by Dr. Dudley and others that the higher the amount of tin the greater would be the amount of lead which could be homogeneously combined. The segregation of the alloy that he endeavored to make was attributed to the low tin content instead of impurity or foreign element.

Experiments With Nickel.

At this point the work on the copper, tin and lead alloy was taken in hand by Joseph G. Hendrickson and myself. We conducted experiments, first with the idea of introducing some element which would cause a quick chilling or rapid setting of the metal after entering the mold. After trying additions of practically all the high melting point metals, we found that nickel was the only one which really gave satisfactory results. Nickel was found to alloy readily with copper and tin, and caused it to set quickly; at the same time, it increased its tensile and compressive strength. By the use of nickel, we were enabled to increase the lead considerably above the former standard as set by Dr. Dudley, that is 15 per cent., while still maintaining tin at 8 to 10 per cent.

We also found it possible to lower the tin content, and even to entirely dispense with it, and still secure a satisfactory alloy for casting, the alloy of copper and lead being found to be more homogeneous when nickel was added than copper and lead alone, although it was found that no advantage could be gained by substituting nickel for tin in order to get the same amount of hardness. Further than this, we found that it was possible to make alloys with small percentages of tin and large proportions of lead without any nickel or the addition of high melting point metal.

Use of Lead.

The fact that lead, without nickel or other admixture, or special treatment of any kind, in large quantities could be added to a copper and tin alloy that is far beyond 15 per cent. with tin below 8 per cent.—the limits of Dr. Dudley's E. X. B. alloy—was a surprise to us, as there had always been a deeply rooted idea in the trade that such an alloy could not be made successfully. That this idea was entirely erroneous we proved beyond doubt, and as the result of many experiments, we found that as a matter of fact it was entirely due to the diminution of tin from the previous standard that it was possible to proportionately increase the lead as the tin was diminished, stopping only at such a point with the increase in lead and decrease in tin when the compressive strength was so reduced that thoroughly practical and commercial bearings no longer resulted. This point we found to be :

Tin	5 per cent.
Lead	30 per cent.

Balance of the alloy, 65 per cent. copper.

This alloy is largely sold under the name of "plastic bronze."

It has a compressive strength of about 15,000 pounds per square inch, and is found to operate without distortion on the bearings of the heaviest locomotives in service, and is used not only for driving brasses, but also for rod brasses and bushings where considerable thrust is encountered.

It is also used in vast quantities on cars of 100,000 pounds capacity, which are the largest cars now in service.

It was well known, as a result of Dr. Dudley's experiments that it was highly desirable for bearing purposes to increase lead and decrease tin in copper, tin and lead alloys, not only for the added excellence of the product, but also because of the decrease in the cost, tin and copper being replaced by lead, a cheaper metal. Two causes of the segregation of lead which were undiscovered were undoubtedly responsible for this erroneous theory. First, tin above a certain limit; second, presence of detrimental amounts of certain other elements existing as impurities.

Microscopic Examination of Alloys.

An explanation as to why it was possible to increase the lead by diminishing the tin was found by a microscopic examination of such alloys. It is clearly shown by examining the structure of copper-tin-lead alloys that the lead is but mechanically held, the copper and tin form a network or matrix, which acts as a supporting structure for the lead, and gives to the alloy its strength and hardness. An examination of the copper and tin matrix showed it to be made up of what we at the time considered free copper and a chemical compound Sn Cu 3, together with a eutectic alloy if the tin was sufficiently high. This eutectic alloy has a very much lower melting point than the balance of the alloy, and consequently, if present, requires a considerable period of time to solidify after entering the mold, and owing to the time required, the lead, which has a very much lower melting point than the eutectic alloy and a very much higher specific gravity, has abundant time to liquate to the bottom of the casting, thus producing an entirely unsalable product. If, however, the tin is kept within the limits where this eutectic alloy is not formed, the whole matrix solidifies at a comparatively higher temperature and therefore solidifies so quickly that the lead has no opportunity to separate, the result being an entirely homogeneous alloy. The point where we found a critical change to take place in the matrix was approximately 9 per cent. tin and 91 per cent. copper. If the matrix were so proportioned that the tin remained below 9 per cent., more than 20 per cent. lead could be added with satisfactory results. Furthermore, as the tin is decreased below this percentage, a correspondingly greater amount of lead could be added.

Messrs. Heycock & Neville have since made a very exhaustive examination of the copper and tin series of alloys, the results of which were published. In this thesis they located very accurately this critical point in the constitution of copper and tin alloys at 9 per cent. tin, and described the constitution of those alloys containing less than 9 per cent. as solid solutions of copper and tin, whereas, beyond 9 er cent. they consist of solid solution of copper and tin, together with the compound Sn Cu 4.

Besides the alloys so far considered, there are a number of other compositions described in specifications of various railroads. These specifications all cover alloys with tin from 8 to 10 per cent., lead from 10 to 15 per cent., with various details as to limitations of the various metals and impurities.

There has also been used continuously since 1887 vast quantities of bearings which are made entirely from scrap. Such bearings have the following composition :

Copper	65 to 75
Tin	2 to 8
Lead	10 to 18
Zinc	5 to 20

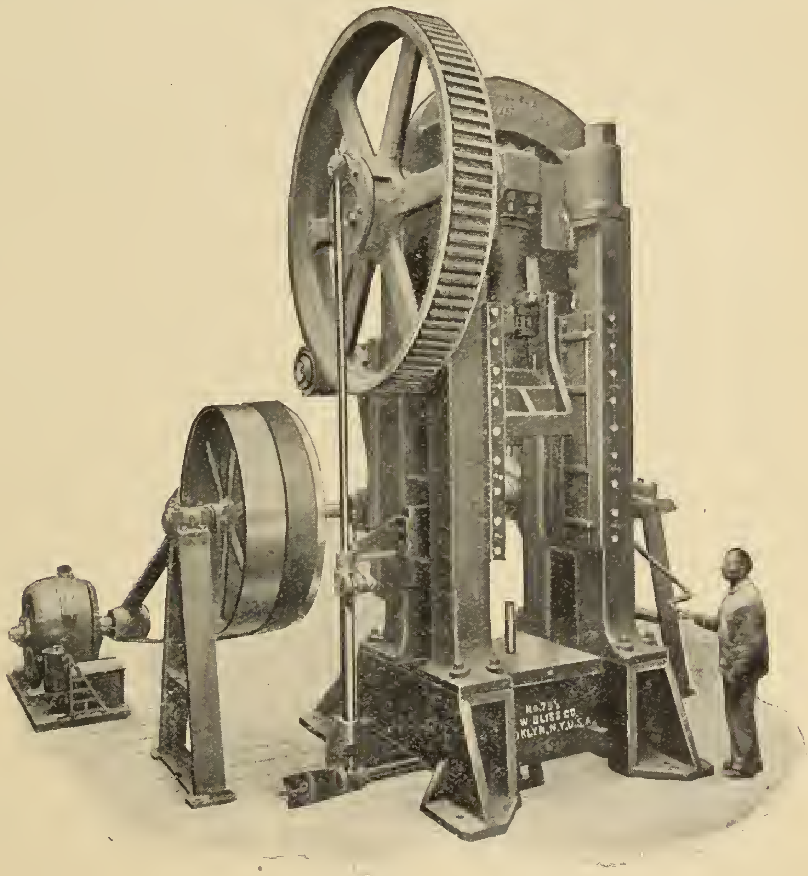
For engine bearings more care has been exercised, and only alloys of approved composition have been used, although within the last few years there has also been a tendency towards using unknown scrap compositions even for engine bearings.

A GIANT "BLISS" SINGLE CRANK PRESS.

The cut shown illustrates a new single crank press recently designed and built by the E. W. Bliss Comoany, 20 Adams street, Brooklyn, N.Y.

This press, one of the largest ever built of its kind, is adapted for a wide range of work such as heavy blanking, trimming, and shearing, also drawing cold from heavy sheet steel, such articles as automobile hubs, cream separator bowls and deep drawn seamless shells. This type of press is adapted for the manufacture of that class of articles that do not require the blank holder that is essential in the manufacture of utensils that are drawn from thin sheet metal, consequently no blank holder with attendant toggle or cam action is provided in this press.

This press is capable of exerting a working pressure of 500 tons.



Giant Bliss Single Crank Press.

For years the German manufacturers have conducted research departments in charge of skilled scientists. That has put German chemical industry at the front of the world. The scientist may work months without making a discovery or turning out a new process or product, but eventually he does, and the manufacturer clinches his hold on the world's trade by simply being an originator.—Silent Partner.

Case Hardening: Influence of Temperature, Time, Materials*

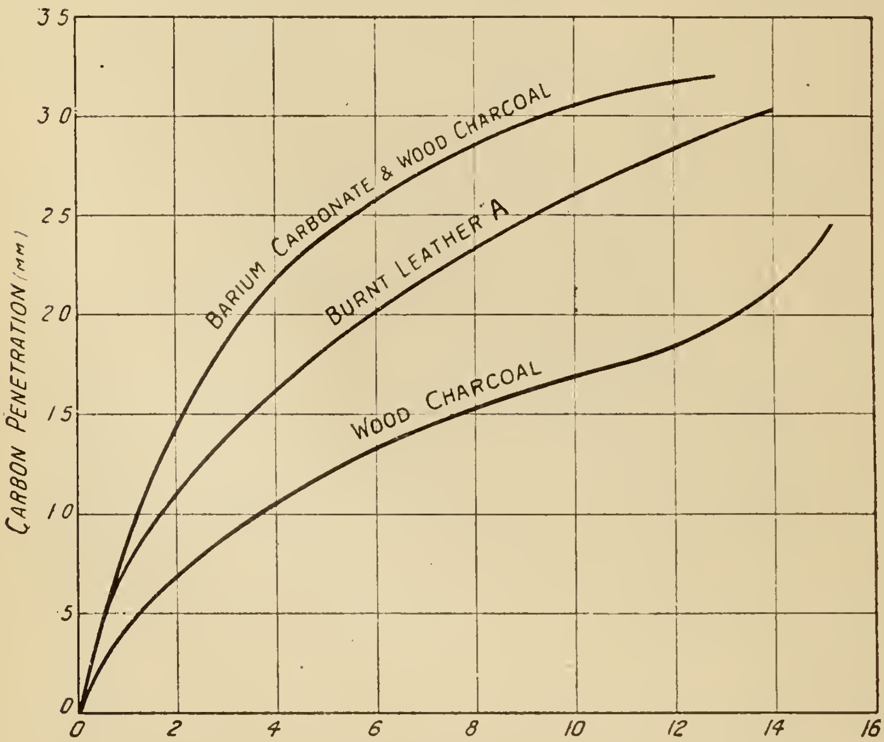
Results of Experiments which are of Practical Use to any Manufacturer doing Case Hardening—Influence of Nitrogen Very Great.

BY G. SHAW SCOTT, M.Sc.

The process known as case-hardening is one which consists of adding such a percentage of carbon to a relatively thin outside layer of iron or mild steel, as will, on correct quenching, produce a hardened surface, whilst the inner core of the metal still retains its initial character.

Case-hardening is conducted in practically all engineering works, whether they be large or small; but, generally speaking, it appears that comparatively little is known of the theory of the process by those who practise the operation, and up to quite recent years crude rule of thumb methods were almost universally applied. The production of satisfactory case-hardened material is a matter of supreme importance to many engineering undertakings, and especially to such industries as cycle and motor-car making, in which there is often required very hard, yet tough, material in order to obtain satisfactory results in everyday use.

Among the many mechanical parts produced by the above industries which require to be case-hardened are free-wheels, chains, gudgeon-pins, roller and ball-bearings, bushes, parts of cam-shafts, steering-gear pins, gear wheels of all kinds, valve levers, etc.



Processes Allied to Case-hardening.

Case-hardening is fundamentally the same as the older process of cementation, the chief points of difference being that in case-hardening a different carbon-conveying material is used from that generally employed in cementation, whilst in the latter process the carbon is allowed to penetrate through, or nearly through, the bars, and is not interrupted so as to form merely a surface or "case" of carburised metal.

Case-hardening is somewhat allied to the Harveyizing and Krupp processes, both of which are employed for the hardening of armor-plate.

In the former process a solid carbonaceous cementing material is employed —usually charcoal; and in the latter a gaseous hydrocarbon is stated to replace the charcoal.

Materials Used in Experiments.

1. Steel.—For the purposes of this research a variety of steel was selected which has been found by experience in the trade to be especially suitable for case-hardening.

On analysis, this steel was found to have the following composition:

	P.C.
Combined carbon	0.14
Silicon	0.01
Sulphur	0.08
Phosphorus	0.03
Manganese	0.58
Iron (by difference)	99.16
	100.00

The steel was delivered in lengths of about 3 feet and had been rolled down to about ¼-inch square. For experimental convenience, each bar, before being used, was cut up into about nine smaller bars averaging 4 inches in length, and after being duly marked for future reference, the bars were stored for use as required.

2. Case-hardening Mixtures.—Of these many were tried, amongst which were included such materials as burnt leather (several varieties), wood charcoal, anthracite, sugar charcoal, mixtures of barium carbonate and wood charcoal, etc.

Owing to its almost universal use in trade circles in England, burnt leather was employed as the standard case-hardening material throughout the research. Two samples of this material in particular were tested, both of which have a considerable sale; they are subsequently referred to as mixtures "A" and "B."

Since preliminary experiments showed that there undoubtedly was a difference in the case-hardening effect due to the relative fineness of the carbonizing material, it was thought desirable first to ascertain the coarseness of the mixture used, and the following table gives the result of an examination of both "A" and "B."

	"A." P.C.	"B." P.C.
Does not pass 10 sieve	68.0	72.6
" " 20 "	9.0	9.6
" " 30 "	4.2	5.8
" " 60 "	4.4	5.4
" " 90 "	4.0	3.8
Does Pass 90 "	9.4	2.6
	99.0	99.8

From the above it will be seen that practically 75 per cent. of the material was comparatively coarse, and that there was rather a high proportion of

* Abstracted from paper presented before Iron and Steel Institute.

very fine material in "A" as compared with "B." Sample "B" was found to contain a considerable amount of unburnt, or only partially burnt, material, and this is a feature in a case-hardening material that does not tend to reliable work.

Estimations of moisture and ash were made in the case of both these mixtures with the following results:

	Moisture per cent.	Ash per cent.
"A"	13.44	5.56
"B"	24.68	3.60

As a result of these experiments, the mixture "A" was decided on as standard, and an estimation of the amount of nitrogen present was made by Kjeldahl's method, I gram of the material being digested with strong sulphuric acid. The acid solution was then heated with excess of sodium hydrate, and the evolved ammonia was absorbed in a known volume of standard acid and determined volumetrically.

The mean of several results showed that nitrogen was present to the extent of 3.2 per cent.

The composition of our standard case-hardening material "A" can, therefore, be represented as follows:

	Per cent.
Carbon (by difference)	77.80
Nitrogen	3.20
Moisture	13.44
Ash	5.56
	100.00

3. Boxes.—For the purpose of heating the experimental bars in contact with the case-hardening mixtures, a number of iron boxes were cast in the University Foundry.

Their length inside was 4 inches, breadth 2 inches, depth 1 inch, and thickness ¼ inch. Boxes made of fire-clay were used in preliminary tests, but the cast-iron articles were found to be much more satisfactory.

4. Muffles.—These were of a recent Morgan type, heated by Mond gas, and capable of giving a temperature of 1,000 degrees C. The temperature of the muffles was recorded by means of a direct-reading Baird & Tatlock thermo-couple pyrometer, the accuracy of which was frequently tested by the usual methods.

The Influence of Temperature on Case-hardening.

The first experiments dealt with the influence of time and temperature upon carbon absorption, employing the standard mixture "A," of which the composition has already been given.

In connection with case-hardening temperatures, it may be pointed out that Mr. Osmond's work has shown that iron does not absorb carbon to any considerable extent below the recalescence point Ar3; or, in other words, that the lowest practicable temperature, using pure iron and pure carbon, will be not much below 900 degrees C., a statement which was checked as follows. Bars were heated for four hours at 700 degrees C. in "A," and subsequent microscopic examination showed that absolutely no carbon penetration had taken place. A slight penetration—to the depth of 0.13 millimetre—was observed after similar treatment at 800 degrees C., whilst at 900 degrees C. the depth of carbon impregnation had increased to 1.58 millimetre.

At 1,000 degrees C. the depth of penetration was found to be more than twice that obtained by case-hardening at 900 degrees C. for an equal length of time. At temperatures higher than 900 degrees C. the danger of overheating the metal was evidenced, and the carbon absorption became both "harsh" and irregular. For normal case-hardening a "case" should be obtained which contains 0.89 per cent. of carbon.

Influence of Time and Cementing Material.

Having briefly considered the effect of various temperatures upon the depth of carbon peneration, when using a standard case hardening mixture, we now proceed to consider the effects of the use of various mixtures for different periods of time, the uniform temperature of 900 degrees C. being employed throughout the series.

Using specimens 3 inches long and 6.5 millimetres square section, the following figures were obtianed:

Time of Heating.	Burnt Leather "A."	Wood Charcoal.	Barium Carbonate and Wood Charcoal
2 hours	1.15 millimetre	0.72 millimetre	1.36 millimetre
4 "	1.58 millimetre	1.07 millimetre	2.20 millimetres
8 "	2.30 millimetres	1.58 millimetre	2.84 millimetres
12 "	2.80 millimetres	1.80 millimetre	3.17 millimetres
16 "		Right across specimen.	

The above results are expressed graphically by means of the curves given in the accompanying diagram, from which it will be seen that the most rapid penetration took place when using the mixture consisting of barium carbonate and wood charcoal, whilst the least penetration resulted from the use of wood charcoal. However, when the heat was sufficiently prolonged, the several mixtures gave approximately the same results.

Case-hardening Materials.

These, as previously stated, are very varied in character, and include such substances as wood charcoal, potassium, ferro-cyanide, potassium cyanide, petroleum gas, bone, horn, graphite, burnt leather, bone black, acetylene, barium carbonate and charcoal, coal gas, sugar charcoal, etc. What is most noteworthy in connection with this list is that of all the materials mentioned those that give the most rapid case-hardening effect are those which either contain nitrogen in some form or other, or else have the power of utilizing atmospheric nitrogen.

The effects of nitrogen on case-hardening are exceedingly important and will be discussed more fully later.

In the case of a non-nitrogenous material such as sugar charcoal or anthracite it is usually assumed that the case-hardening action comes about in the following way. Air in the cementing-box unites with the carbon forming carbon monoxide, which gas reacts upon the iron thus:

$$2CO+3Fe=Fe_3C+CO_2.$$

The liberated carbon dioxide acts upon a further portion of carbon producing still more of the monoxide:

$$C_2 \times C = {}_{22}CO$$

Thus the process is continuous, and the carbon monoxide will continue to carry carbon into the metal until the latter becomes saturated. It was, however, shown by Sir W. Roberts-Austen that pure iron and pure carbon can unite without any intermediate action of carbon monoxide; while Professor Arnold considers that the sub-carbide ($Fe_{24}C$) plays an important part in the carburization of iron or steel.

As regards cyanides, these are not much used for case-hardening, except for small work that requires merely a skin hardness, but a mixture which may depend upon cyanogen products for its effectiveness has been successfully adopted by Dr. Guillet in France. This consists of 60 per cent. of wood charcoal and 40 per cent. of barium carbonate, and its effectiveness has been substantiated by the author of this paper.

Dr. Guillet suggests that this increased case-hardening effect is due to some property of barium carbonate which enables it to absorb nitrogen with the formation of an effective cyanide of barium. Braune has also observed the value of nitrogenous cementing materials, and has shown that with iron containing 0.35 per cent. carbon the nitrogen content in the "case" increases from 0.01 per cent. before cementing to 0.07 per cent. after cementing, but that this large increase occurs only as a result of employing a nitrogenous sub-

stance such as bone charcoal. When using wood charcoal it appears that the nitrogen increases only from 0.01 per cent. to 0.024 per cent. According to Braune, whatever cement be used, the effect of subsequent reheating is to cause a gradual diminution in the amount of nitrogen in the metal, and so long as the amount of this gas does not exceed 0.035 per cent. the metal will not be brittle.

Nitrogen and Case-hardening.

All the case-hardening materials in common commercial use contain nitrogen in some form or other. It is obvious that unless practical experience had shown that nitrogen aided the process in some way, no one would think of using a costly nitrogenous material in place of charcoal or anthracite, these being well known possible substitutes which cost only as much per ton as burnt leather costs per cwt.

To prove how slight was the effect (measured by carbon penetration) of heating our standard steel bar with materials other than those which contain, or supply, nitrogen, experiments were made with onthracite, and also with good hard coke. The carbonaceous material in each case, together with the bar to be treated, was packed gently in one of the special iron boxes prepared for this research, and after being carefully luted down the box was heated in a muffle for four hours at 900 degrees C. After this heating it was found that there was penetration to the following extent.

(a) Anthracite—

0.15 millimetre on 6.5 millimetre bar.

(b) Best hard coke—

0.16 millimetre on 6.5 millimetre bar.

As a result of heating a bar under exactly similar conditions, but using as a carbonizing material burnt leather "A," instead of the above, a penetration of 1.58 millimetre was obtained. From this it will be seen that the effect of the nitrogenous mixture was to increase the depth of penetration during the initial stage of case-hardening in the ratio of about 10 to 1. Hence it will be recognized that nitrogen must play a very important part in the process of case-hardening. As a result of the consideration of the above facts relating to the possible effect of nitrogen in conducting to rapid case-hardening, further experiments were undertaken, which briefly were as follows:

Two exactly similar bars of standard steel were selected. One was heated in an atmosphere of ammonia for four hours at 550 degrees C. The other meanwhile received no treatment. Afterwards, both were heated in separate cast-iron boxes in a non-nitrogenous carbonaceous material (sugar carbon) for eight hours at 1,000 degrees C. The mean figures of a series of these experiments showed that the "ammonia bar," as compared with the untreated bar, had received greater proportionate penetration in the ratio of 45 to 32. The high temperature employed was specially favorable to the non-nitrogenous material, and had the heating been conducted at a lower temperature, the difference would, in all probability, have been still greater.

Subsequently, an apparatus was made by means of which it was possible to pass dry ammonia into the case-hardening box during the whole period of heating in the muffle. For this purpose one extremity of a piece of ½ inch gas-pipe some 2 feet long was screwed into the end of one of the boxes. The other extremity, which projected outside the muffle, was connected to an apparatus for giving dry ammonia.

In the same muffle as the above box, and placed side by side with it, was an ordinary box. Both were filled with sugar charcoal as a non-nitrogenous carbonizing medium, and among the charcoal several test-bars were placed.

For four hours the muffle containing the two boxes was kept at 900 degrees C., a stream of ammonia being passed through the special box, escaping through a minute hole drilled in the lid. Afterwards the boxes were allowed to cool, ammonia still passing into the special box. On subsequent superficial examination the "non-ammonia" specimens were found to be bluish-black in color and quite soft to the saw. On the other hand, all the ammonia-treated bars possessed a distinct whitish lustre, and presented a tough outer skin to the saw.

Microscopic examination enabled the depth of carbon penetration in each case to be measured. This showed that whereas the bars which had received no ammonia treatment gave a peneration figure of 1.44 millimetre, those which had been treated with the gas had been penetrated by the carbon to the extent of 1.80 millimetre.

It will thus be seen that the result of the experiments was to show that ammonia did actually cause an increase of carbon penetration, but that the amount of this increase was perhaps not quite as great as might have been anticipated under the circumstances surrounding the experiment.

"Twinning" Resulting from Ammonia Treatment of Bars.

Mention must here be made of the peculiar results obtained by heating bars at a certain temperature in ammonia. After treatment with ammonia for four hours at 550 degrees C. the bars showed a bright, silvery lustre, and on microscopic examination, a structure at the edge of each specimen was observed which showed very obvious "twinning."

A uniform structure was always observed right through the bar. To show that the "twinning" was not produced by the distortion of the bar by some mechanical strain, a bar was held in the vice and bent backwards and forwards several times until fracture occurred. No twin-crystals resulted from this treatment, or from violent and rapid sawing or hammering. It is therefore evident that these twin-crystals were not present in the original steel, nor were they induced by any subsequent mechanical treatment, but that they were produced by heating the bars for a more or less prolonged period at 550 degrees C. in an atmosphere of ammonia.

Theory of Case-hardening in Presence of Nitrogen.

As it appears to be abundantly clear that nitrogen in some form is necessary for the practical performance of case-hardening, the question arises as to the manner in which nitrogen assists the rate of carburization. That the free gas itself has no effect upon steel has been proved both by Guillet and by Braune. Ammonia, on the other hand, is absorbed by iron, and the experiments above recorded prove that it causes an increase in the rate of carburization when carbonaceous material is present. This latter fact suggests that ammonia itself, whilst being the prime agent in any change, may conceivably lead to the formation of cyanogen, and that this cyanogen may act upon the iron thus:

$$2CN+2Fe_3=2Fe^3C+2N$$

from which it will be seen that the cyanogen may act as a carrier of carbon to the metal to be carburized.

This, however, does not explain why carburization takes place at a lower, temperature when nitrogen compounds are present. But it has been shown that after steel has been heated in ammonia "twinning" is observed. Now, since Osmond has shown that twinning can only result when iron or steel is in the γ condition, it is reasonable to assume that the metal has been changed from the a to the γ state. Under normal conditions, metal at 550 degrees C. would certainly be in the a condition. Nitrogen, we may conclude, should therefore be added to the list of elements which cause iron to take or retain the γ form. And since γ iron combines more readily with carbon than does a-iron, this action of nitrogen, on the iron, would appear to sufficiently explain its beneficial effect during the early stages of the process of case-hardening.

DEVELOPMENTS IN MACHINERY

New Machinery for Machine Shop, Foundry, Pattern Shop, Planing Mill; New Engines, Boilers, Electrical Machinery, Transmission Devices.

NEW DESIGN AUTOMATIC RACK-CUTTING MACHINE.

The accompanying illustrations show a new design and several new features which have been embodied by Messrs. Gould & Eberhardt, Newark, N.J., in their line of patent entirely automatic rack cutting machinery. An important change has been made in the design of the bed of the machine. This was formerly made of the box leg type supporting the main table bed. The new construction is a solid mass of metal resting on the floor. The cutter slide is actuated on the draw-cut or "pull-down" principle, and in conjunction with this style of bed furnished an ideal example of the rigid anvil type of construction, insuring not only increased feeds, but greater accuracy in the work. That part of the bed which supports the upright cutter slide stanchion is also cast as an integral part of the main bed casting, still further enhancing the rigidity of the entire machine. It has been the purpose of the manufacturers to design a machine that will be capable of obtaining to the fullest extent the benefits to be derived from the use of high speed steel cutters.

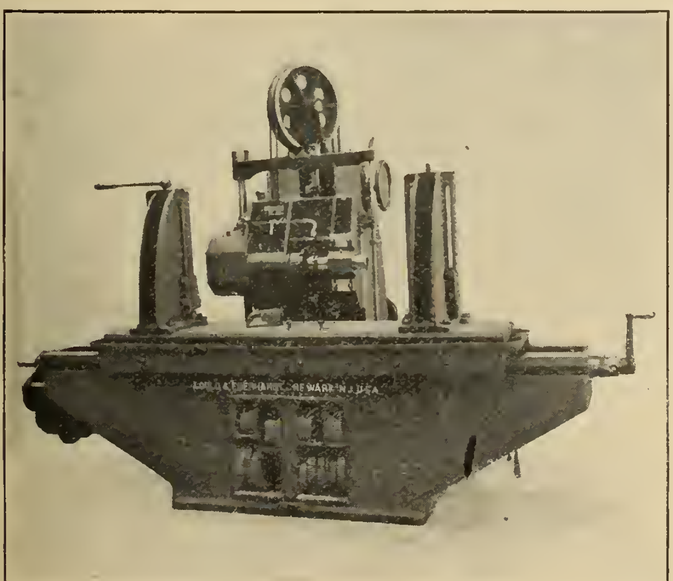


Fig. 1.

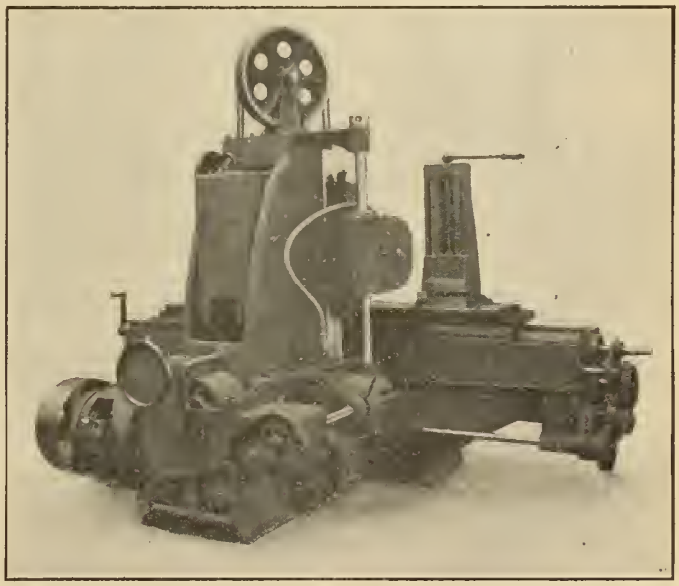


Fig. 2—New Design of Automatic Rack Cutting Machine.

This machine was furnished to one of the large planer manufacturers for cutting their planer table racks, and duplicate machines out of this lot have been furnished to other manufacturers of machine tools, printing presses, and for notching large track scale beams. The machine shown has a capacity for work up to 6 ft. long at one setting, and longer lengths of rack can be cut by shifting the blank after the first series of teeth have been cut. It will cut any width of face up to 10 ins., or a series of narrow-faced racks can be held in the vises up to the full capacity of the machine, and any pitch up to as coarse as $1\frac{1}{2}$ diametral in cast iron or 2 in steel, using from 1 to 12 cutters, depending on the pitch to be cut. It is possible to use a gang composed of one roughing and one finishing cutter, at the maximum rated capacity of the machine.

The gang cutters which are used on this machine have their cutting points set spirally to avoid chatter and rapid dulling of the cutting edges.

The cutter slide is counterbalanced, and is so arranged that it cannot possibly feed downward unless the proper divisions and all previous movements have been completed. The cutter spindle is located approximately in the centre of the slide, and large bearing surfaces insure rigidity and freedom from chatter under the heaviest work. The cutter spindle is driven through double spiral gears, one pair being placed on the outboard end, and the other pair close up to the cutter, where the full driving effect can be obtained. One of these two pairs of spiral gears is cut right-hand and the other pair left-hand. This herringbone gear effect thus neutralizes all end thrust in the cutter spindle. The guard over the gears has been removed in Fig. 1 to show the position of this spiral gear drive, immediately adjacent to the cutter.

The feed to the cutter slide ranges in geometrical progression from $\frac{3}{4}$ in. to $14\frac{1}{2}$ in. per minute, thus providing a range that will economically take care of all classes of work. The feed is taken from the single driving pulley of the machine, through the gear box at the rear end. Cutter speeds changes are provided from 12 to 76 R.P.M. in geometrical progression.

Chucks or vises for holding the rack blanks are rigidly held to the top of the table by means of bolts in T slots. The vises are so designed that they can be fastened solidly, metal to metal, with the top of th table, without springing or warping the latter out of line. The table is provided with generous bearing surfaces and strongly gibbed to the ways of the main bed casting.

The blanks are held in a vertical position and consequently the cutter slide travel is vertical. This permits of the chips and cuttings dropping down out of the way of the cutters. There is an opening in the bed of the machine through which chips and lubricant are drained, the latter flowing into a pocket which is cast in the bottom of the bed, where a screen separates the

chips from the oil. A second pocket is formed in the oil pan bed, into which the lubricant rises and from which it is again pumped to the cutters.

Another innovation embodied in this machine, which will be found very useful where there is a variety of work to be cut, as in a jobbing ship, is the fact that by simply changing a couple of gears it can be set to divide for either circular or diametral pitches or for modul or metric circular pitch, using the same lead or dividing screw. An auxiliary end adjustment for the table screw is provided, which is oftentimes found useful in resetting work to be recut, or in taking a light skim off one side of a tooth. The table is geared to use the traveling movement in either direction, saving wear on the various parts, and obviating the necessity of returning the table every time a new blank is set. In this machine the dividing or advancement of the table for each tooth to be cut is accomplished by a positive driving mechanism, thus reducing to a minimum the chance for error. Adjustable stops are provided, which can be set at any predetermined point to automatically throw out the feed to the table advancement. In addition to cutting racks, the machine can also be used for milling or facing off spots on castings and similar work, generally done on a vertical milling machine.

The entire construction has been simplified, and only one belt is required to drive the machine, the various movements being transmitted through splined shaft gearing, etc. This also makes it convenient when it is desired to drive the machine by individual constand speed motor. A number of the new features of this machine are being patented. It is made in 6, 8 and 10 ft. sizes.

THE LIBBY TURRET LATHE.

The accompanying illustration is of the new Libby turret lathe, which is being built by the International Machine Tool Co., Indianapolis, Ind. It is the design of Mr. Chas. L. Libby, who has had extended experience in work of this kind in both this country and Europe. It is intended for the general run of chucking and turning work for cast iron and steel parts up to 20 inches in diameter.

Spindle Driving Mechanism.

The machine is built in the heavy, rigid style necessary for the effective use of modern high speed steels.

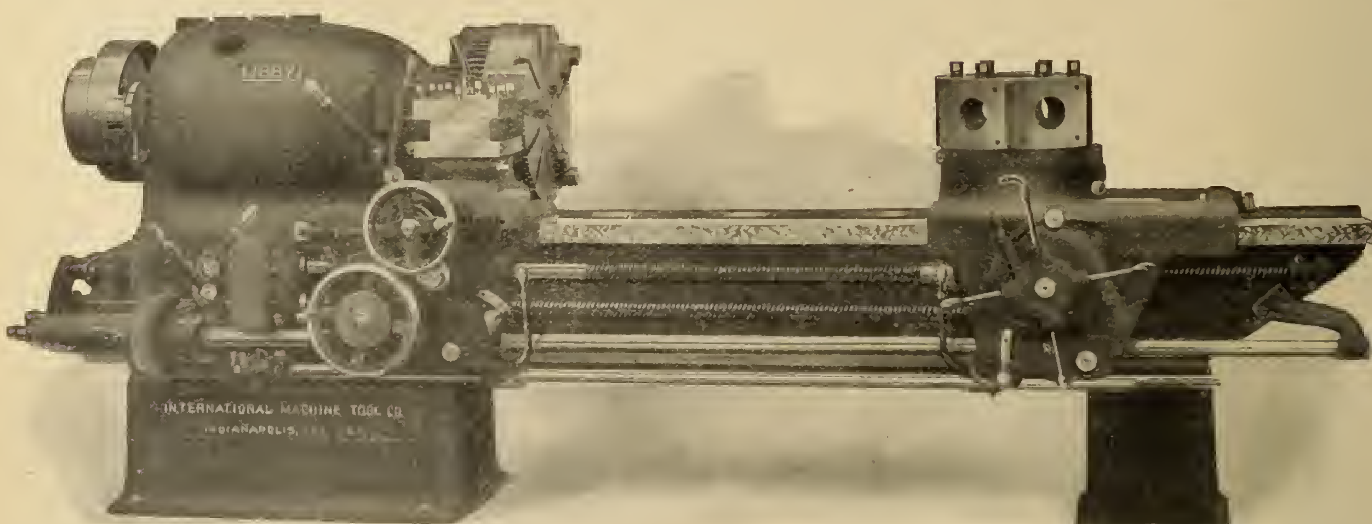
It is driven from the two-step cone pulley through a mechanical speed changing mechanism enclosed within the head-stock and operated by the two levers at the front of the main bearing. These levers give four changes of feed, which are multiplied by the two obtained from the driving pulley, and these in turn by the three obtained from the three-speed counter-shaft, giving 24 changes in all. The speeds vary in geometrical progression from 5 to 180 revolutions per minute.

One of the features to which attention is called is the provision made for changing the machine from belt to motor drive independent of the builder. The motor can be mounted on the finished pads on the head stock.

Tool-Post and Turret Slides.

The tool-post carriage is of unusual construction. It does not extend across the bed, but is supported by the front way and by a V-guide at the bottom of its apron, bearing on a corresponding way on the lower edge of the bed. A long taper gib fitted to the carriage on the inside of the bed takes up the wear. The tool-post carriage may be moved past the chuck toward the head-stock. This permits the use of the turret close up to the chuck, avoiding the overhanging tools usually required to reach over the tool-post cross slide. It is evident, also, that nearly the full capacity of the lathe can be swung over the carriage.

The six-sided turret is supported on a spring pivot bearing which is adjustable to its load, and takes the weight of the turret and tools off the annular bearings, thereby reducing the friction and the wear, and permitting it to be indexed easily. The clamping device acts at the outer edge of the turret, bringing it down firmly to the annular bearings after the indexing has taken place. The same lever that tightens and releases the turret clamp operates the turret locking pin. Throwing the lever in one direction releases the clamp and withdraws the locking pin. The turret may then be swung to the desired position. By throwing the same lever a little further over, the locking pin is released and the turret located. By again bringing the lever back to its original position, the turret is once more rigidly clamped.



The New Libby Turret Lathe.

Feed Mechanism.

The feed motion is operated from the spindle through change gearing and a quick change apparatus. Eight changes may be obtained by operating the two levers shown beneath the head-stock, and eight changes more are regularly provided for with the detachable gears furnished with the machine. Either English or metric threads can be cut without changing the screws. The feeds and screw threads obtainable vary from 1 to 200 revolutions of spindle per inch of slide movement.

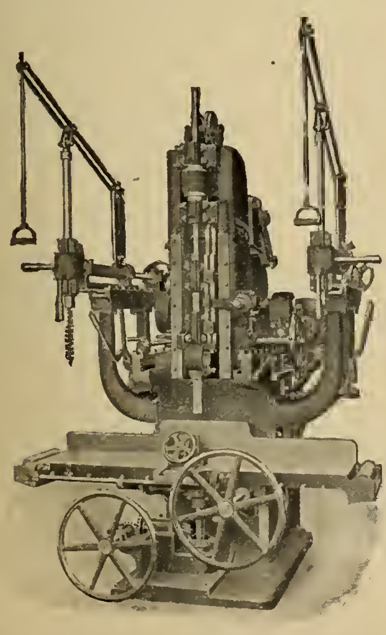
The feed connections for the tool-post carriage and turret slide are entirely

separate, so that the feed of either apron can be reversed without interfering with the other. Both carriages may be shifted independently by quick traversing devices. This movement can be operated at any time by the action of a single lever, the setting of the feed not interfering with this. The rate of movement of the quick traverse is about 25 feet per minute. The screw cutting and power feeds are applied to both carriages. In the tool-post carriage the cross and traverse feed screws have the same lead. All the handles for operating the various changes, both of the speeds and feeds, are within easy reach of the operator, as he stands in working position. All the moving parts, as may be seen, are encased to prevent injury to the mechanism or the operator.

Automatic stops are provided for feeds in all directions. In connection with these stops, there is an indicator or moving pointer which registers the exact position of the turret cutting tools. This can readily be seen by the operator, and makes possible the attainment of duplication of work to a degree of exactness that would otherwise be difficult. The gearing of the turret apron is so arranged that one revolution of the pilot wheel gives only ½ inch of movement to the slide. With this ratio, the operator has sufficient leverage to bring the tool up to a heavy facing cut without exerting himself unduly.

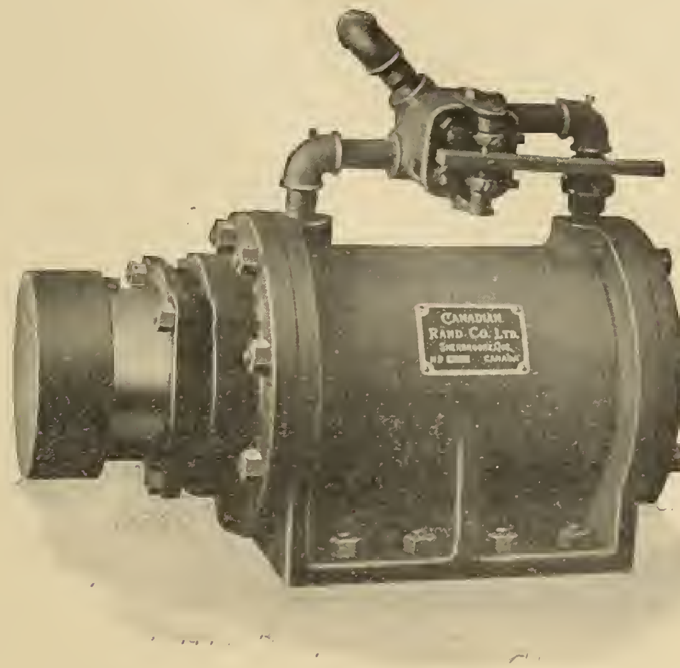
A CAR MORTISER FOR HEAVY WORK.

The latest car mortiser built by the J. A. Fay & Egan Co., 362-382 W. Front St., Cincinnati, Ohio, is designed for



A Car Mortiser for Heavy Work.

heavy work in both car and bridge construction, and is made with one, two or no auxiliary boring attachments. It has a capacity for mortises from ½ in to 3 in square, and up to 6 in. deep; or by reversing timbers, 12 in. deep. The frame is a single-cored casting with wide base of immense weight. The housing is securely gibbed to the frame with provision for taking up wear and moves transversely on frictionless rollers by hand wheel and can be securely locked in any position desired. The chisel ram is gibbed to the housing, and has a vertical travel of 18 in. The auger spindle is driven at the proper speed by a belt with take-up so that the strain is constant regardless of the position of the housing. The reciprocating motion of the chisel ram is produced by a pinion in a rack operated by friction pulleys, giving a constant and positive drive. The table is made either stationary or traveling. The stationary table is 6 ft. 6 in. long and is provided with stops to regulate the length of mortise. It is operated by hand wheel, rack and pinion and can be raised and lowered by hand. The traveling table can be furnished any length desired. It is made of steel I-beams, has automatic feed under instant control of the operator and is provided with adjustable stops for regulating the distance between mortises. The countershaft is self-contained in the base of the machine, convenient for direct connection of motor drive. It has tight and loose pulleys 18 in. x 8½ in. face, and should make 840 R.P.M. The auxiliary boring attachments angle 30 degrees in either direction. The two spindles have a vertical stroke of 18 in. and a lateral adjustment of 18 in., and are driven by independent countershafts, having tight and loose pulleys 10 in. x 4½ in. face, and should make 750 R.P.M.



A Pneumatic Ram.

A UNIQUE PNEUMATIC RAM.

An interesting operation at the works of the Dominion Car and Foundry Co., Montreal, is pressing the broke heads on the brake beams. A pneumatic ram built by the Canadian Rand Company, Montreal, 10 in. by 10 in., was installed and used with an air pressure of 80 lbs. per sq. inch. The press or ram was mounted on a steel frame with a post bolted at the opposite end of the frame. The space between the post and the ram is just sufficient to take in the brake beam and allow for the stroke of the ram.

One operator controls the air while another puts on the brake heads, first the one next the post, and then the one next the ram. The work is supported on two bars and as the brake heads are pressed on the brakes are passed along on these bars.

Some time ago it was found necessary to replace the 10 in. cylinder with a 14 inch one and the ram can now be adapted to heavier work.

The valve is both dust proof and air balanced with four cylinders supplying air to either end of the press. The principal advantage of this style is that instead of drawing in air from the shop and admitting dust and dirt to the cylinder, the air is taken from the receiver on the forward stroke and is exhausted from the front to the back part of the cylinder on the backward stroke. This arrangement takes air on only one stroke, thus preventing dust entering the cylinder.

FOUNDRY PRACTICE AND EQUIPMENT

Practical Articles for Canadian Foundrymen and Pattern Makers, and News of Foundrymen's and Allied Associations. Contributions Invited.

METAL MARKET SITUATION.

The metal markets, generally, have shown a tendency to strengthen during the last month. Smaller purchasers are coming into the markets in greater number, which is a most encouraging sign, as they are more faithful trade barometers than the larger consumers. The latter, buying in their many carloads, influence the markets more quickly, but they do not represent so accurately the general prosperity of the country. Stocks all around are light, and there should be some strong movements shortly. With the industrial activity that is going on, stimulated by the opening up of spring, the holding-off disposition manifested by users should soon give way.

The English pig iron markets have shown increased strength all through the month, with the exception of the last week. At one time Cleveland warrants were fully 4 shillings per ton higher than the lowest point touched in January. A decline of sevenpence has now taken place, but on the long established firmness of the market, this does not necessarily indicate any weakness. Cleveland warrants are now quoted at 51 shillings and threepence.

Conditions in the States are not so favorable, there being some cutting in the south, but taking everything into consideration, the situation in pig iron, generally, is most satisfactory. Good mid-winter trade for prompt delivery has been done here and many of the large consumers are now in the market for their spring and summer supplies.

Copper, in the closing weeks of the month, has strengthened, especially in the Old Country, and the market for the time being is firm. This is probably due to the better tone of the American market, where under the influence of somewhat stronger buying, prices have rallied a little. Canadian quotations are 14¼ to 14½c. under slow buying.

Tin has proved the most sensational of all the metals. A spot scarcity has prevailed in New York, where users have had to pay heavily for not covering themselves properly. In the English market, owing to the announcement that the Dutch Government were going to restrict the sales of Banca tin, a strong bulling movement took place. The price fell away again, but the closing week has seen another strong bulling movement, and tin is quoted at £139 15 shillings, an advance of over £12 since the last week in February. Quotations on local markets have advanced accordingly, and tin is now marked at $34. Inquiries are opening out well.

Spelter is getting stronger again in the Old Country, while in the States prices have held pretty firm for some time. Local quotations are holding at $5.25 to $5.50 for foreign, and $5 to $5.25 for domestic. The demand is very quiet.

Lead is in a very depressed state, and there is little business doing. Quotations in the Old Country have been on the downward grade for some time, and the bottom has not yet, apparently, been reached. Local quotations have now been cut down to $4 for imported pig.

CHICAGO FOUNDRY FOREMEN'S ANNUAL EXHIBIT.

The second annual exhibit of the Chicago Foundry Foremen was held at the Lewis Institute, Chicago, on March 5, 6 and 7, and it was very successful. The objects of this association are educative, and a great deal has been accomplished along this line, this event being ample evidence of it.

Eugene W. Smith, President, welcomed the members and visitors to a suggestive speech, being in part as follows:

"In the pursuit of knowledge we resort to many means. The seeker after knowledge must first realize how little of it he really possesses. In the past it was possible for a foundryman to mystify his neighbors by the addition of a little foreign material to his metal—and a few prevarications—but to-day the conditions are changed.

"A few years ago the average foundryman would object to the idea of a 'Doctor' to assist him in production (with all due apologies to Dr. Moldenke and Mr. Kawin). To-day the metallurgical chemist has become a valuable assistant.

"A few years ago the foundry foreman was boss when a pattern was to be constructed. To-day, with advanced ideas of the patternmaker foreman and the assistance of modern productive machinery, their interests have become mutual.

"Only a few years ago there came upon the market a crude machine of the squeezer type to press the mold. To-day we have with us the products of many minds, novel, ingenious and serviceable. To-morrow who can tell what the result may be?

"Our meetings are open to all who may desire to attend, whether members or not, and our papers and discussions are entirely restricted to educational subjects. We invite the co-operation of all foremen, chemists, etc., who may be our guests."

Papers Presented.

Among the papers presented were:

E. H. Mumford gave a talk on the French system of universal molding machines.

A very instructive paper by Dr. Richard Moldenke on Foundry Waste, which we hope to present in our next issue.

Papers on talks by C. C. Karwin, Chicago; H. M. Lane, Secretary Foundry Supply Association; A. O. Backert, editor Foundry.

The Exhibits.

The exhibits were, of course, one of the chief attractions. In the foundry section there were exhibits of molding machines by the Arcade Mfg. Co., Freeport, Ill.; Killing Molding Machine Co., Davenport, Ia.; E. H. Mumford Co., Philadelphia, Pa. (the E. H. Mumford Co. also illustrated appliances for producing patterns and stripping plates in the foundry); Henry E. Pridmore Co., Chicago; Sandwich Mfg. Co., Sandwich, Ill., and the Tabor Mfg. Co., Philadelphia, Pa.

In this room there were also exhibits by the Goldschmidt Thermit Co., New York; Garden City Sand Co., Chicago, and the Kroeschell Bros. Co., Chicago, and the latter company exhibiting the Schwartz gyrating flame furnace.

Among the exhibits of core machinery were those made by the Brown Specialty Machinery Company, Chicago, showing the hammer core machines: S. H. Brand Co., Chicago, showing the Eureka core machine, and the Falls Rivet & Machine Co., Cuyahoga Falls, Ohio, showing the Wadsworth core machine.

Woodworking machines were exhibited by the Fox Machine Co., Grand Rapids, Mich; the Oliver Machinery Co., Grand Rapids, Mich., and the Killing Molding Machine Co., Davenport, Iowa. The S. Obermayer Co., Cincinnati, had in operation a core oven for the demonstration of core compounds. The J. W. Paxton Co., Philadelphia, had an exhibit

of brushes and riddles and similar foundry supplies. The Calumet Engineering Works, Chicago, had a representative in attendance to describe the new Calumet cupola with drawings. W. C. Toles Co., Chicago, exhibited pattern markers' vises. The Norton Emery Wheel Co., Worcester, Mass., showed grinding wheels and grinding machinery.

Exhibitors of pneumatic tools were: The Chicago Pneumatic Tool Co., Chicago, and the Ingersoll Rand Co., New York. The Hanna Engineering Co., Chicago had an exhibit of reciprocating and revolving riddles operated both by air and electricity.

New Things.

A number of machines were here shown for the first time. The new rollover molding machine, made by the Killing Molding Machine Co., which places the finished mold in position on the floor, the Tabor Co. had a large rollover machine with pneumatic attachment which enabled them to roll over molds weighing up to 1,000 lbs. The machine is also equipped with vibrator and pneumatic drawing cylinder, which insures accuracy in drawing the pattern.

The E. H. Mumford Co. exhibited for the first time the patternmaking equipment used in connection with the universal system of molding machines. The Kroeschell Bros. Co. also exhibited for the first time the Schwartz gyrating flame furnace.

George H. Wadsworth had a new cutting-off and coning attachment for use in connection with machine-made cores.

The Killing Molding Machine Co. exhibited a new electrically-driven benchsaw. In the exhibit of the Hanna Engineering Works was a new rotating riddle which can be turned over so as to dump the refuse. The small bench molding machine shown by the Sandwich Molding Machine Co. was also new, being the invention of Mr. Estep.

Preparation for Foundrymen's Convention, Toronto

Active Steps Have Been Taken During the Past Month Preparing for Convention — Meeting of Executive of Foundry Supply Association in Toronto

During the past month very active steps have been taken by Canadian foundrymen towards taking all preliminary steps in the interests of the convention of the American Foundrymen's Association and the Foundry Supply Association, which is to be held in Toronto during the second week in June. Papers by eminent foundrymen on topics of interest will be given at the sessions of the Foundrymen's Association, and Machinery Hall and the Process Building at the Exhibition grounds will be devoted to foundry exhibits. Machinery Hall is being devoted to the molding machine exhibits and other exhibits which will be in operation.

STANLEY G. FLAGG.

President American Foundrymen's Association.

DR. RICHARD MOLDENKE.

Secretary American Foundrymen's Association.

H. M. LANE.

Secretary Foundry Supply Association.

A feature of the exhibits this year will be the fact that there will be a cupola installed which will supply iron for pouring the molds prepared by the different molding machines. This cupola will be exhibited by M. De Clercy, Montreal.

This feature of the convention of

L. L. ANTHES.

Vice-President American Foundrymen's Association and Convener of Committees for the Preparations for Convention in Toronto in June, 1908.

making exhibits has been improved from year to year, until it is now an education which no foundryman or foundry foreman can afford to miss. At the last two or three conventions some Canadian foundrymen have picked up ideas which they have utilized to excellent advantage in their foundries. This year it is certain that the exhibits will be more complete and better than ever before, and Canadian foundrymen should take advantage of this opportunity of seeing the latest foundry machinery and equipment.

Meeting of Foundry Supply Executive.

On Monday and Tuesday, March 2 and 3, a meeting of the executive committee of the Foundry Supply Association was held in Toronto. The following members of the executive were present: E. H. Mumford, W. S. Quigley, J. S. McCormick, F. N. Perkins, W. E. Kanaval, J. S. Smith, E. J. Woodison, Geo. Rayner and H. M. Lane.

Monday morning the members of the committee went out to the Toronto Exhibition Grounds to see the buildings in which the exhibits are to be made. They were all very highly pleased with the facilities for exhibiting which Toronto afforded. One feature with which the members of the executive were very well pleased is the arrangements which had been completed with the railway companies by the local committees for the handling of the exhibits. Railway sidings run right to the grounds and the railways have promised to send carload lots out to the grounds and also to handle small exhibits and have them shipped to the grounds. This does away with all the laborious cartage with which so much trouble was experienced at former conventions.

After lunch the executive held their meeting, at which was discussed matters pertaining only to the Supply Association.

After this meeting there was a general meeting of the members of the executive together with the chairmen of the various committees, which had been reorganized to arrange for the convention, at which the entertainment features were discussed very freely and valuable suggestions were obtained from the members of the executive of the Foundry Supply Association.

H. M. Lane spoke to the assembly meeting briefly explaining the relations which existed between the American Foundrymen's Association and the Foundry Supply Association.

L. L. Anthes, vice-president of the American Foundrymen's Association and convener of the committees, outlined what had already been done and asked for any suggestions which could be given by those present. He pointed out that final arrangements had been made with the customs authorities regarding the bonding of incoming exhibits, so that no duty will have to be paid. He also spoke of the before mentioned arrangement with the railways for the handling of the exhibits.

In regard to the entertainment features, Mr. Lane pointed out that the Foundry Supply Association has usually looked after the badges, and would also do so this year. In addition they could guarantee $500 towards the entertainment features, and perhaps might increase this amount later.

Entertainment features were fully discussed, the following features being given special attention: An evening reception given by the City of Toronto, at which His Honor, the Lieutenant-Governor of Ontario, would probably be present, thus giving the convention a national significance; a smoker, which was unanimously decided would be held at all events; a moonlight excursion, a boat to be chartered for that purpose. But owing to the feeling that there should not be more than three nights at the most taken up in entertainment features, the other features were not discussed to any extent.

It was also pointed out that arrangements would be made for parties to be taken to the different foundries and manufacturing plants in Toronto and the vicinity.

THE WOODISON CRUCIBLE OIL FURNACE.

The accompanying illustration is of a crucible oil furnace made by the Detroit Foundry Supply Co., Detroit, Mich.

The great advantage of this furnace is its economy of fuel and labor. It has been demonstrated by actual tests made in Detroit, that brass and bronze can be melted at 7½c. per cwt. This is on a basis of fuel oil at 4c. per gallon; that heats can be taken out of a No. 70 crucible in 55 minutes.

Another advantage which this furnace has, is the fact that no metal is lost, as would be with a coke furnace. If the furnace tender gets careless and spills metal over the side of the pot, it goes to the bottom of the furnace, and after they are through at night, or the first thing they do in the morning is to drop the bottom out and get all the metal back, whereas with a coke furnace it is badly mixed with the ashes and the ashes usually sold to a refiner at $10 or $15 per ton, and yet, conservatively speaking, the loss is 2 per cent. through slop-over.

There is no noise from the furnace, nor flame or fumes whatever come therefrom.

One furnace tender can take care of considerably more furnaces that he could with coke furnaces.

SOME WHOLESALE IDEAS.

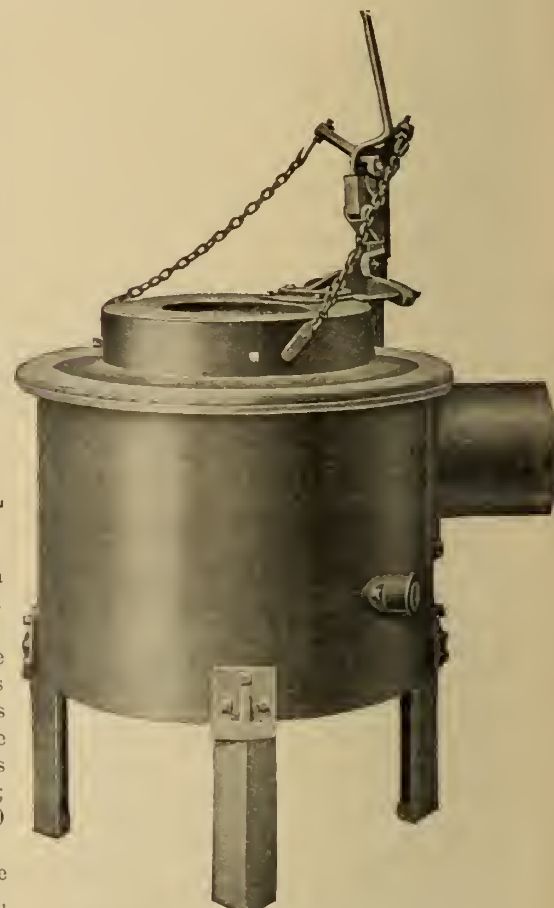
Edison said the other day that what the world needs most is $100,000 men.

Somebody else expressed a similar thought when he said that the world is looking for somebody to tell it what to do next.

And yet there is hardly a man who is not worth more to himself than he is getting, if the matter were only gone about right.

But it is morally certain that very few men and women are making the most of their opportunities.

One of the commonest cries is lack of time. What we would accomplish if we only had the time! And all the time we are wasting as much probably as is spent in actual labor.



The Woodison Crude Oil Furnace.

Go through the shop and ask a workman why this or that job is not complete and the answer is that he hasn't had time.

The workman may not be a "soldierer." He may not consciously kill time. But the chances are if the truth were known that carelessness and wasteful ways of going about things cause a loss of time almost as great as actually spent in work.

The business man himself is probably just as inefficient a worker as the man in the shop. He either so enmeshes himself in detail that might better be delegated or he wastes time in poor system or bodily habits.

Molding Machines: Principles Involved in Their Operation

Several Types of Molding Machines Representative of Various Principles Involved in Molding Machine Practice; Machines in Canadian Foundries

What is a molding machine? A molding machine is purely and simply a mechanical molder and differing from its human competitor can work the whole twenty-four hours without stopping, knows no distinctions between Sundays, holidays and any ordinary day, requires as its only lubricant a little oil, being in fact total abstinent in all other matters, has no near relatives dying at awkward moments, has no athletic propensities, belongs to no labor organization, knows nothing about limitation of output, never thinks of wasting its owner's time in conversation with its fellow machines. Wars, rumors of war and baseball scores, have no interest for it and its only ambition in life is to do the best possible work in the greatest possible quantity.

Some person gives the foregoing definition of a molding machine; and it strikes the nail on the head pretty well. Molding machines are not at all new on the market. They were used 20 years ago. But the last few years have seen great improvements in molding machine practice, and the field of usefulness has been greatly broadened. This has been due to a large extent to the awakening of foundrymen in recent years to the necessity of placing foundry practice on a more scientific basis. Wonderful strides have been made as a result of this awakening. The American Foundrymen's Association and the many local associations have done great educational work; and the technical press has done its share.

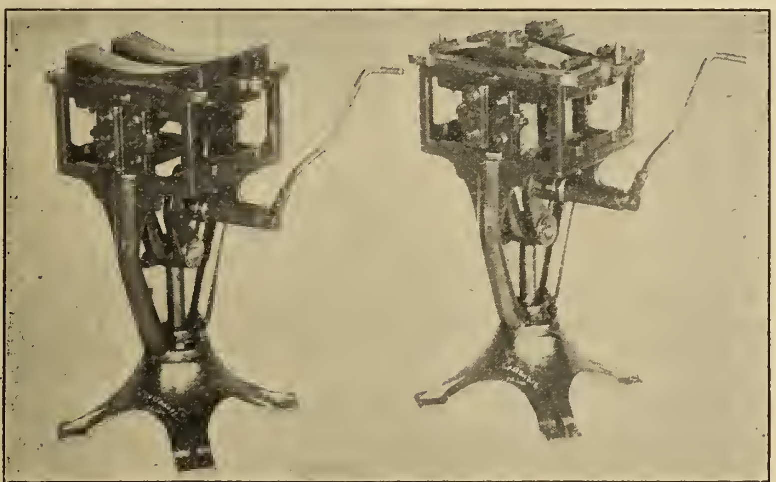


Fig. 1—Pridmore Stand Machine.

During the last one or two years Canadian foundrymen have been realizing the value of molding machines and several installations have been made, which are now doing good work. Some during the last year include some of the most expensive molding machinery. One foundryman at the present time is installing a large number of machines for duplicate work. It is safe to predict that, after the convention of the American Foundrymen's Association to be held in Toronto during the second week in June, there will be many more installations.

The purpose of the present article is to illustrate and describe a few of the types of molding machines now on the market, some of which are quite old and some quite new, but all interesting. This will be followed by articles descriptive of installations which have been made in Canada, showing exactly what different classes of work are being done on molding machines, and with what economy.

Something quite noticeable about the molding machine industry is this, that most of the machines now on the market are the result of experimental work conducted by some manufacturing concern to fill some want in their foundry, and after having been tested out and developed in this way the manufacture of them on a commercial scale was started. For instance, the Pridmore machines were designed in the experimental department of the McCormick Harvesting Machine Co. in 1888, and proved so valuable in that foundry that their manufacture was started. The same is the case of the Farewell molding machines, made by the Adams Co., Dubuque, Iowa.

These people experimented with molding machines for 15 years for molding hardware specialties. They finally developed this machine for their own use, and in 1896 started making them.

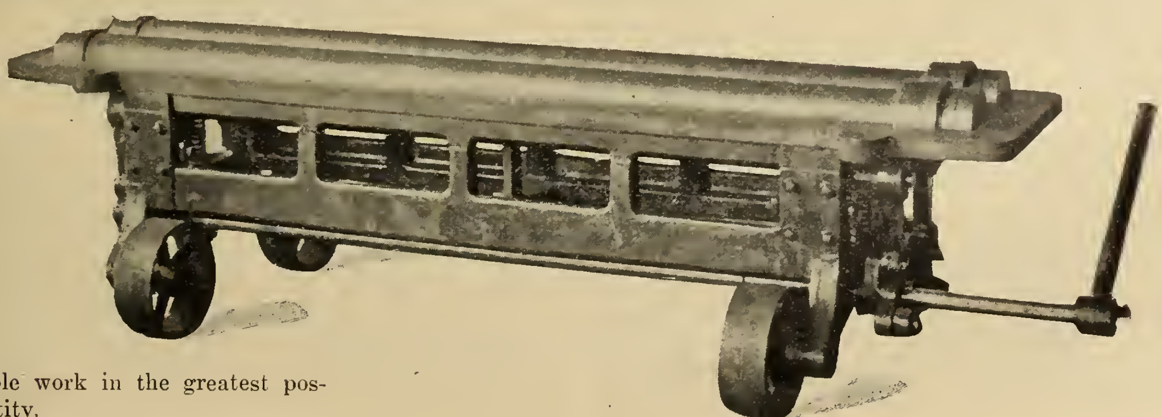


Fig. 2—Pridmore Singe-Crank Machine.

The Herman Pneumatic Machine was developed in the same way, and others.

There are many different principles

involved in the molding machines now manufactured, the difference being chiefly in the methods of ramming the sand and removing the patterns from the

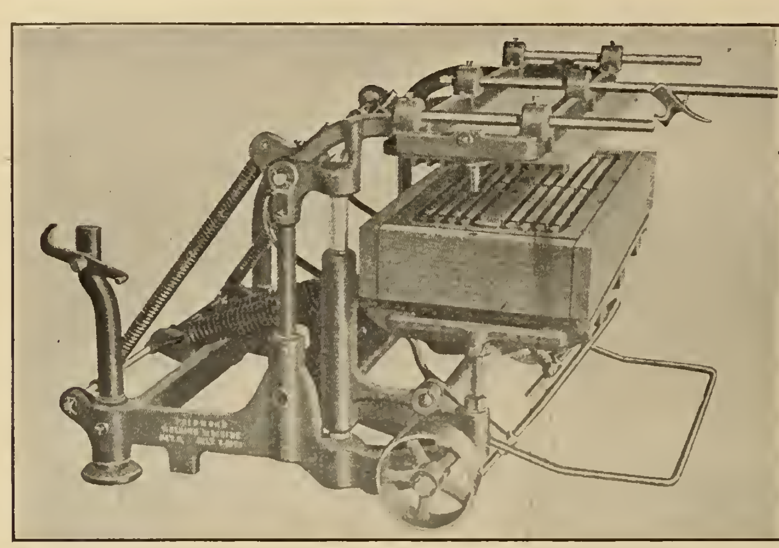


Fig. 3—Pridmore Rock-Over Drop Machine.

sand, and of course, in the detail construction of the machines. Molding machines are also stationary or portable.

The Pridmore Machines.

One of the oldest machines on the market is the Pridmore, made by Henry E. Pridmore, Chicago. A great variety of machines are made by this firm, but Figs. 1, 2 and 3 are indicative of the types. Figs. 1 and 2 are both stripping plate machines, that is, the patterns are

Fig. 4—The Farewell Automatic Molding Machine.

Fig. 5—The Farewell Automatic Molding Machine.

removed from the sand by use of a stripping plate and a yoke to which the patterns are attached. In these machines the yoke is lowered by means of a lever or handle, thus removing the patterns. The ramming is done by hand. Fig. 1 is known as a stand machine, while Fig. 2 is a single crank machine. There are also double and treble crank machines. The class of pattern and the amount of necessary draw determines the kind of machine. If the draw exceeds 4$\frac{5}{8}$ inches a shaft machine is necessary. The construction of these machines can be seen from the illustrations. The machine consists of a stiff frame, having two or more sets of adjustable guide ways near the top of the frame, on which the stripping plate is supported, while at a distance from the upper guide ways there is a single, centrally located, brass bushed guide way. This guide way carries the yoke carrying the pattern. The yoke is raised or lowered by means of a crank. There are simple adjustments on all the machines regulating the amount of draw necessary to different patterns.

This type of machine is best suited for duplicate work, where many castings are made from one pattern. The cost of the stripping plate and mounting of patterns on the yoke is prohibitive unless a number of castings are to be made from the same pattern.

Fig. 3 shows a machine developed by the Pridmore people for setting up molds in foundries where the number of castings to be made from one pattern would not warrant a stripping plate machine. This is called the Rock-over Drop machine, from its operation. The two main operations of this machine consist of rocking the patterns over and dropping the mold away from the pattern. The illustration shows the machine after the flask has been rocked over and the mold dropped away from the pattern. The flask is, of course, hand rammed as in the stripping plate machines.

The operation of fitting patterns to these machines is simple and can be performed rapidly. Either wooden or metal patterns can be used. The machine, as can be seen, is portable.

The Farewell Molding Machines.

The Adams Co., Dubuque, Iowa, make a complete line of molding machines for all classes of work. In these machines the flask is pressed by the machine by means of a lever. The machine in its simplest form is merely a press. The molds are lifted from the patterns.

In Figs. 4 and 5 is seen the Farewell

automatic molding machine, which figures show the machine in different stages of operation. This machine is designed to make a complete snap mold.

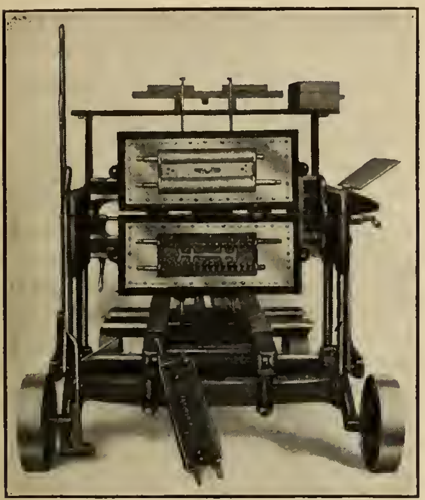


Fig. 6—The Modern Molding Machine.

By a few rapid and easy motions of the operator, the machine is made to separate the flask and admit the pattern plate, turn the flask over (and after sand has been riddled and shoveled into drag) to pein the drag, clamp on bottom board, turn over (and after filling cope) pein the cope, press the mold, cut all sprue holes or draw flat gate, separate mold, draw pattern, close mold and remove the finished mold from the flask, leaving it ready to be placed upon the floor.

In Fig. 4 the flask has been separated, the pattern plate has been allowed to swing between the cope and the drag and by adjusting the lever the flask has been allowed to rest firmly on the table. Sand has been riddled and shoveled into the drag and the peining frame on the turret top has been pressed into the drag. The surplus sand is now struck off and a bottom board placed on the sand and clamped. The flask is then turned over, and the sand riddled and shoveled into the cope. The cope peining frame, which is brought automatically into position, is pressed into the cope and the surplus sand struck off level. Both cope and drag are then pressed in one operation, as shown in Fig. 5. The presser board on the turret top which takes its place automatically, presses into the cope while the bottom board is forced into the drag from below. If sprue cutters are attached to the presser board, no further sprue cutting need be done. Flat gates can be placed on the pattern just before the cope is filled with sand and can be drawn automatically by the presser board. The flask is then separated, the pattern plate passed to the rear as shown in Fig. 5 and the two halves of the mold again brought together, closing the mold, ready to be taken from the flask and placed upon the floor. The ribs that hold the sand in the cope are rocked back flush inside which allows the mold to slide out and at the same time the two parts of the flask are locked together.

The Modern Molding Machine.

The modern molding machine, made by the Arcade Mfg. Co., Freeport, Ill., is shown in Fig. 6. This firm make two machines, their No. 1 and No. 2. the first for flasks 14x22 inches or less, and the latter, shown in the figure, for flasks up to 12x30 inches or 16x24 inches, if placed side by side.

The patterns used on this machine are in the form of match plates or split patterns. In other words, the cope and drag halves of the mold are formed at the same time.

The operation of the machine is as follows: In the beginning the table holding the plates is turned face up with the two halves of the flask attached to the table. After the sand is thrown into the flask, the cope and bottom boards are placed and two clamps hold them in position. Then the table is rolled over, and pressure is exerted upon the sand by means of the lever at the left of the machine. This pressure releases the clamps, and the pattern is drawn by gradually allowing the lever to regain its normal position and by vibrating the pattern at the same time. The mold then rests upon the sliding platform which is drawn forward to a convenient position and the mold closed in.

The Berkshire Molding Machine.

In the January, 1907, issue of Canadian Machinery, there was a description of the Berkshire molding machine, but for the convenience of readers it is reproduced here. Fig. 7 illustrates this machine, and also the sand conveyor as set up in the foundry. This machine is completely automatic, every step in the entire process, even to the screening of the sand, is performed automatically. The operator places the flask and bottom board in position and throws the starting lever. Then in 8 seconds, it is claimed, one-half of the mold is made without further action on the part of the operator.

In detail the machine operation is as follows:

The flask and bottom board having been put into position and the lever thrown, the sand is sifted in the riddle at the rear of the machine, and then conveyed in a bucket-elevator to the hopper above the machine. The flask is next automatically carried to the rear, where it is filled with sand. It then travels forward and is met in its course by the bottom board supported upon the ram, which is forced down, thereby ramming the sand.

At the instant of ramming, the vibrator is automatically thrown into action, which makes impossible the formation of any vacuum, and also prevents the sand from adhering to the pattern. The lifting pins then raise the flask off the pattern. While the flask returns to receive its supply of sand, the bottom board is supported by suitable hooks, but as the ram comes down, these hooks are drawn back so that the board re-

Fig. 7—Berkshire Molding Machine and Sand Conveyor.

mains upon the mold. All the operator has to do is to lift off the flask and set it to one side, blow the sand from the table with the air hose, and all is ready for placing the other half of the mold.

The attendant may economize time at this point by placing the second half of the flask upon the machine, and throwing the starting lever before removing the half-mold already completed from the bench. By the time he has removed the finished half-mold to the floor, the second half mold will also be completed, and will be ready to be lifted off.

When using snap flasks and making light molds, the mold may be assembled at the side of the machine, thereby making necessary but one trip to the floor. In such case, the molder can have two sets of flasks, and arrange it so that the machine will be ramming the drag for the second mold while he is carrying the first to the floor.

The pressure of the ram upon the sand can be quickly adjusted, and as the flasks are filled automatically, every flask will be rammed alike. It is also possible to adjust the boards in such a way that the drag will be rammed harder than the cope. When making the cope, the machine is so arranged that it cuts the sprue.

The pattern plates are placed in an ordinary table, or platen, at the front of the machine, and can be changed easily and quickly by removing four screws which hold the plate in position, and slipping in the new plate.

Pneumatic Molding Machines.

There are several machines on the market which are pneumatically operated. The Tabor Pneumatic Roll-Over machine made by Tabor Mfg. Co., Philadelphia, is one of these. This machine is specially useful on heavy pattern work. This machine does all the handling of the flask in connection with the making of the mold by using compressed air in a centrally located cylinder. The cylinder is so connected to the roll-over table that to roll over the flask and then to draw the pattern. When the flask is rolled over it is received upon a V-shaped equalizing support which insures an accurate bearing. The pattern board is provided with a very heavy vibrator. Deep parallel patterns can be drawn without the aid of draft. This is made possible by accurately machined guides with the assistance of the vibrator. This machine at the Chicago Foundry Foremen's annual exhibit on March 5, 6 and 7 was handling a half mold weighing 960 pounds with perfect ease. It was also drawing a pattern having parallel sides 9 inches in length.

The Herman jarring pneumatic molding machine, made by Herman Pneumatic Machine Co., Lelienople, Pa., is also pneumatically operated. This machine is illustrated in Fig. 8, and its operation can be judged from the illustration. This is only one type of the machines made by this firm. The table plate of this machine is 16x19 inches and is well adapted to take deep flasks of the same lineal dimensions. The work on the machine at the time the photograph was taken was skein boxes with four patterns in one flask and in this case stripping plates were used, though it can be readily understood that the majority of work can be rammed on this machine without this supplementary aid. From the illustration it will also be seen the two side lifting cylinders; these have a two fold action, one of which is to lift the mold away from the pattern as shown in the illustration, and the other is to lift both mold and pattern together, which can then be rolled over in the trunions at the head of the lifting pistons, and the pattern drawn upward from the mold, as in the ordinary method of hand molding.

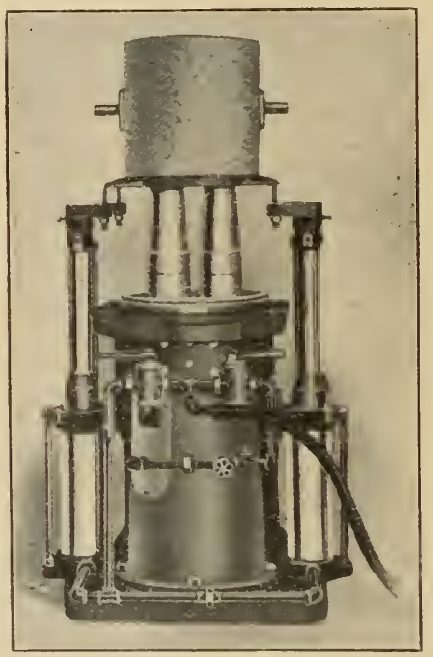


Fig. 8—Herman Pneumatic Molding Machine.

The principle involved in this machine is an up-and-down movement striking upon the resilient surface. By this jarring swells and scabs are eliminated, venting is unnecessary because the sand is jarred uniformly and is packed most densely around the pattern, while the top is less compressed and being more porous allows easy escape of the gases.

The Gravity System of Molding.

Another important type of molding machine is that employing the force of gravity for ramming the molds. This principle was first talked of at the convention of the American Foundrymen's Association at Cleveland in 1906. At the convention in Philadelphia a year later, the Mitchell-Parks Mfg. Co., St. Louis, had a machine in operation. The sand is conveyed to the top of a stand by buckets on endless chain arrangement and dropped into the flask.

Several Types of Machines Operating in Canadian Foundries.

There are several other makes of molding machines, but the foregoing give the reader a fair idea of molding machine practice. There are several Canadian foundries in which molding machines are in successful operation, and others are now installing them. For instance, the Canada Foundry are using quite a number of Pridmore stripping plate machines; Standard Fitting and Valve Co., Guelph, are using a Berkshire machine; Somerville, Ltd., are using a Tabor machine in their brass foundry.

In the next few issues of Canadian Machinery will appear articles dealing with molding machines as they are used in Canadian foundries, with records of just what they are doing.

A FAMILY OF MOULDERS.

The following sketch of the Burman family is a remarkable illustration of the way a trade will sometimes stick to a family. Geo. Burman, superintendent of the King Radiator Co., Toronto, is a well known man in the Canadian foundry industry, and it was from him that the following story of how the Burman family for three generations have been molders was obtained. It reads like a tale of the olden days when son followed father in a trade from generation to generation, and when the family name was significant of that trade. George Burman has in his possession the membership card of Thos. Burman, grandfather to George Burman in the Friendly Iron Molders' Society, England. This is a very interesting document, illustrating something of the mutual aid societies of that date, 1837. It is interesting to compare this with present day societies and associations and note the development.

This would be reproduced, but its condition does not permit without considerable retouching, which would spoil the original document. The document reads :

This is to certify that Thos. Burman, Sr., entered this society November, 1837, not being entitled to any benefit whatever, until the expiration of twelve months from his entrance, nor for tramping money for two years. We therefore recommend him to the kindness of our brother members.

	£	s.	d.
Amount of entrance		12	
Do. 12 months' contributions			
Total.........			

Entered in London.

W. W. Waterman, Secy.

Thos. Burman was one of the first members of this society. Chas. N. Burman, son of Thos. Burman, and father of George, started in the foundry at the age of ten years. Part of his work was to carry lunch to the men in the foundry. He became a member of the society in 1848. In 1850 he came to America and worked at New York and Buffalo (which was called Chippawa at that time), where he made parts for the old suspension bridge, the Maid of the Mist and the Clifton House. Charles Burman has three sons, Thomas, James and George.

Thos. Burman is superintendent of Shirley Radiator and Foundry Co., Shirley, Ind., and readers will perhaps remember having read articles by him in Canadian Machinery. George, as before stated, is superintendent of King Radiator Co.

Chas. Burman's brother was a molder and had two sons, both molders, one being superintendent of Engineers' Foundry, London, Eng., for 14 years, now dead, and the other still living in London.

This is certainly a family of foundrymen.

PERSONAL MENTION.

David Hunt, Jr., general sales manager of the Warner & Swasey Company, Cleveland, Ohio, sailed on February 29 for a three months' trip abroad. Mr. Hunt expects to spend his time visiting England and the Continent.

Hon. A. C. Killam, chairman of the Railway Commission, is dead. Mr. Killam was born and educated in Nova Scotia, graduated from Toronto University, and was admitted to the Ontario Bar in 1877. He was called to the Supreme Court Bench in 1903, and upon the resignation of Hon. Mr. Blair from the chairmanship of the Railway Commission, he was invited to accept the position in 1905. His has been a busy life, well spent.

C. A. Holden, late assistant engineer in the power construction department of Winnipeg, has been appointed superintendent of the city power plant and lighting system at Moose Jaw, Sask., vice A. C. Read, resigned.

D. Findlay, sales manager for L. S. Starrett Co., Athol, Mass., was in Toronto this month renewing old friendships. He began his business career with Samuel Benjamin & Company about twenty years ago. After receiving a thorough training there he went to Athol, where he has risen from a junior to the position he now holds.

Dr. Richard Moldenke, secretary American Foundrymen's Association, was in Toronto for two days during March.

W. G. Reid, foundry foreman, Dodge Mfg. Co., Toronto, has taken a position with the Collingwood Shipbuilding Co., Collingwood.

Messrs. C. W. Cross aud W. B. Russell, of the New York Central, New York, visited Montreal recently and were much interested in the apprenticeship systems used on the C.P.R. and G.T.R. They visited the various railroad shops in the city and the rooms in which the apprenticeship classes are held.

Mr. William Gell, master mechanic of the Grand Trunk, has been appointed master mechanic in charge of motive power, cars and shops of the Grand Trunk Pacific, with temporary headquarters in Winnipeg.

J. D. Stoddard, of the Detroit Testing Laboratory, has spent a large part of the month of March in Toronto, organizing and getting under way the Toronto Testing Laboratory, of which company he is president.

Celestin Couanon, from the selling staff of Fenwick Freres & Co., representatives of John F. Allen in Paris, has been making a month's visit at the Allen works, 370-372 Gerard Avenue, New York City, familiarizing himself with the various types of Allen riveting machines. Upon the return of Mr. Couanon to Paris it is proposed to take up a strenuous campaign in the sale of these tools in France.

Hugh Lamont, formerly with the Detroit Testing Laboratory, is treasurer and general manager of the Toronto Testing Laboratory, Saturday Night Building, Toronto.

NEWS OF THE SOCIETIES.

C.S.S.E. Dinner.

The London branch of the Canadian Society of Stationary Engineers held a very successful banquet at the City Hotel in London on March 6. Over one hundred and fifty were present. W. Norris, secretary, was chairman and toastmaster.

The committee responsible for the success of the banquet were: George England, chairman; W. Norris, secretary; S. Cosford, treasurer; Geo. Moll, president; F. S. Glass, past president; Fred. Rose, Geo. D. Fowler, vice-president.

The Gas-Power Section of the A.S.M.E.

Following the lead of the Franklin Institute and other engineering societies, members of the American Society of Mechanical Engineers, have organized a gas-power section for those interested in this line. This section welcomes all who are interested in gas-power in any form whether members of the parent society or not, invites papers and discussion from any source.

The first meeting of the new section was held on Feb. 11 at the Engineering building, with H. H. Supplee presiding and Professor Lucke as secretary.

Engineers' Club.

On Feb. 20 an illustrated address by Prof. R. W. Angus, Faculty of Applied Science, Toronto University, was given on Gas Producers and Power. The address was for the most part historic and descriptive of different types of plants. Some figures on fuel consumption, obtained in England and the United States, were given.

Social Evening of C.R. and E.C.

The members of the Central Railway and Engineering Club of Canada had a very pleasant social evening in their club rooms in Toronto on March 17. A paper on "The Origin of Societies" was given by Mr. Geo. Baldwin, of the Canada Foundry Co., after which the members adjourned to another room, where entertainment was furnished and light refreshments served.

Canadian Mining Institute.

The Canadian Mining Institute held their annual meeting in Ottawa in March, when the following officers were elected: Dr. W. G. Miller, president, Toronto, acclamation; W. Fleet Robertson, vice-president, Victoria, B.C.; Geo. E. Drummond, vice-president, Montreal, Que.; M. Mortimer Lamb, secretary, Montreal, Que.; J. Stevenson Brown, treasurer, Montreal, Que.

Canadian Society of Forest Engineers.

A society consisting primarily of professional foresters employed in Canada was formed in March at the Place Viger Hotel, Montreal to be called the Canadian Society of Forest Engineers. The following officers were elected: President, Dr. B. E. Fernow; vice-president, R. H. Campbell; secretary-treasurer, F. W. H. Jacombe.

CANADIAN MACHINERY
and Manufacturing News

A monthly newspaper devoted to machinery and manufacturing interests, mechanical and electrical trades, the foundry, technical progress, construction and improvement, and to all users of power developed from steam, gas, electricity, compressed air and water in Canada.

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Vol. IV. APRIL, 1908 No. 4.

CONTENTS

THE LESSON FROM BOILER SQUABBLE.

From the squabble over the boiler tenders for the Toronto water works, an account of which appears on another page, the city council should learn this lesson, that they should not deal with engineering questions independent of the engineering department unless they have received competent advice elsewhere. Whatever the relative merits of the two boilers, the city engineer was quite justified in refusing to accept responsibility for their decision. When the new phase of the tender was brought up by the letter of J. J. Main, Polson Iron Works, the council should have referred the whole question back to the engineering department, or they should have obtained other competent advice as to the relative merits of the two boilers before they took any further action. That would have saved them the ignominy of having to refer it back after having twice decided the question, and also would have saved them the uneasiness of having the Babcock & Wilcox Co. threaten legal proceedings.

The question has now finally been settled by the Board of Contròl, upon the advice of the City Solicitor, advising that the Babcock & Wilcox Co. could have no grounds for suit, accepting the tender with the provision that the boilers made by the Polson Iron Works Co. be used.

But the engineering department still refuse to accept responsibility for the installation.

This is rather a peculiar and a most unsatisfactory situation of affairs.

ASSOCIATION OF FOUNDRY FOREMEN.

Glancing over the history of the American Foundrymen's Association, one is impressed with the great amount of educational work which it has accomplished.

Attendance at the convention of the Chicago Foundry Foremen's Association, held in Chicago in March, shows the great amount of educational work which can be accomplished by such an organization.

Such an organization as the one in Chicago and other cities would do excellent work in Ontario. Meetings could be held for the reading and discussing of papers and for the interchange of ideas. A convention might be held annually at which foundry equipment and supplies would be exhibited.

Such an organization would have beneficial results to both the foundry superintendents or foremen themselves and the employers.

There is a foundry foremen's association in Hamilton; but this should be broadened to include a wider territory.

QUEBEC BRIDGE DISASTER.

The report of the Quebec Bridge Commission has been given out (published on another page) and the conclusion arrived at is practically that suggested in our editorial in the December issue of Canadian Machinery, that the fault was in the design itself, not due to a flaw or defect in the material, and that the unit stresses were too great. The problem was one greater than any engineer had so far been called upon to solve and the data that the expert designers, Messrs. Szlapka and Cooper, had was not sufficient for such an immense undertaking as the Quebec bridge. The commissioners attribute the cause to errors in judgment on the part of these two engineers, which cannot be attributed either to lack of common professional knowledge, to neglect of duty, or to a desire to economize. The unit stresses were higher than any established by past practice. The formulae at best are more or less at error, and the factor of safety was too low to allow for the dead load. The work done by the Phoenix Bridge Co., however, in fabricating the material was good, and the steel and the structure was of good quality.

The Quebec Bridge and Railway Co. do not go without blame. They are criticized severely for not employing an experienced bridge engineer as chief engineer, and the commission state that the loss of life might have been prevented had there been a more thorough inspection of the bridge as it was being built.

It is interesting to note that the engineer of the Phoenix Bridge Co. throws the entire blame on Mr Cooper, in that the specifications for the part of the bridge that gave way; the drawings were made according to the specifications; when completed they were sent

to Mr. Cooper, who approved of them; when the resident engineer sent them back with an adverse criticism Mr. Cooper returned them with the remark, "They are all right; don't alter them."

The engineer of the bridge company is still quite certain of the feasibility and trustworthiness of a properly planned and constructed cantilever bridge across the St. Lawrence River at the selected point. And members of the government say that the bridge must be built, since it is an essential link in the continuity of the National Transcontinental Railway.

PRODUCER GAS REPORT.

The report of the Hydro-Electric Power Commission on producer gas has been submitted to the legislature, and while there are many features which might be advantageously commented upon, there is one feature which deserves special prominence, and that is that if satisfactory results are to be obtained from producer gas plants the type of plant should be selected and the plant installed under the supervision of a competent person, independent of the selling agent, and that a trained man be placed in charge of it. Very few plants have been installed in Canada and operated under these conditions, and that, no doubt, accounts in a large measure for the findings of the commission in regard to the reliable or unreliable operation of plants in Canada.

As Mr. Stern, one of the engineers, points out, there are many plants which have been in successful operation for years, especially in England, Germany, and other European countries, where plants are made and installed by competent men, and these plants are absolutely reliable, the attendance, repair, fuel, water and oil consumption being low. What has been done in these countries can be done in Canada if good common sense is used by the manufacturers and selling agents and by the people who have plants installed.

Up to the present time in Canada there have been far too haphazard methods used in installing and operating producer gas plants, and the report of the Commission shows that it is time now that selling agents stop preaching the "pound of coal per horsepower-hour" sermon, and make more stringent efforts to see that justice is done producer gas plants in Canada in the way of installation and operation.

DEFINITE DATA ON PRODUCER GAS.

Four years ago practically little or nothing was known by Canadian manufacturers about producer gas for power. Then when the history of producer gas was discussed, when different plants were described, and when fuel consumption figures from tests made in England and other countries were given, it was all welcome.

But now conditions are changed. Producer gas is no longer a new thing in Canada. There are more than one hundred plants installed.

It is time now we heard less of what plants in England and the United States are doing, and more of what plants in Canada are doing. Canadian manufacturers wish to hear about something they can see. With one hundred plants installed, why should they not hear and see more of them?

Canadian manufacturers and agents for gas plants are preaching the economy of producer gas, and when cornered practically the only data they have is of tests made in England or some other places thousands of miles away. They made absurd claims for the fuel consumption and quote the aforesaid tests made under the best of conditions, and not under operating conditions. What a prospective purchaser wishes to know is what his coal will cost him per brake horsepower used when he has the plant in everyday operation. They are naturally afraid of a new thing until they have definite information.

Manufacturers and selling agents of producer gas plants are doing themselves incalculable harm by stating and publishing figures for coal consumption which cannot be substantiated in practice.

The coal consumption of reliable producer gas plants is undoubtedly low, and with a good plant a manufacturer will have satisfaction. Why give misleading figures when the actual figures are sufficient to make a man sit up and think? If a firm has made an installation, why does he not have a reliable engineer make an independent brake test of the plant, and report on the exact coal consumption and other features under actual operating conditions? Would not that report be a convincing argument for a prospective purchaser, when he can see that same plant, and discover how it is operating. If the plant is a good plant, figures obtained from such a test would be convincing. If a maker believes he has a good plant it is now time for him to show the courage of his convictions.

PROMPTNESS IN CORRESPONDENCE.

A firm is often judged by its correspondence, and in many instances a pretty fair estimate of the firm's standing can be formed in this way. Promptness is one of the chief essentials in good correspondence. It shows that a firm is alive every day and all day. Manufacturers or other business firms who neglect this point in their correspondence are slighting one of the first ways of assisting in the building up of a good reputation.

TALKS FROM PUBLISHER TO READER.

The steady progress which is being made in Canadian Machinery can well be realized from a comparison of this issue with the April issue a year ago. In the former issue there were 47 pages of advertising, and in the latter, 62 pages; that means an increase of 15 pages.

* * *

The rate of increase in advertising is a good barometer of the intrinsic value of a paper in its field. This increase of 15 pages is a percentage increase in one year of 32. That indicates a good, healthful condition, does it not?

* * *

Wherein lies the reason for this splendid growth? It lies in the fact that more than twice the money and effort is now being spent in making the paper of absolute value to its readers than a year ago, and also in the fact that a most effective subscription campaign is being carried on.

* * *

Good editorial matter brings good readers; good readers bring advertisers. Quoting from the "Silent Partner," "It is a noticeable fact that the magazines of to-day that are a conspicuous success—that are carrying the most advertising and obtaining the best results for advertisers—are those with a definite and honest editorial policy—those with a purpose." Canadian Machinery has an honest editorial policy—it has a purpose.

* * *

During the last nine months the wages in the printing trade have increased 55 per cent., and there will be further increases to 1912. Printers and publishers pay a larger per cent. of cost to labor than any other business in Canada. It is evident, then, that we need this increase in advertising to keep things going.

POWER GENERATION AND APPLICATION

For Manufacturers. Cost and Efficiency Articles Rather Than Technical.
Steam Power Plants ; Hydro Electric Development ; Producer Gas, Etc.

PRODUCER GAS PLANT AT McCLARY MFG. CO.'S WORKS, LONDON.

One of the largest and most interesting gas power plants of the suction type in America, is that recently installed and now in operation at the McClary Mfg. Company's Works, at London, Ontario. It speaks well for producer gas that one of the largest manufacturers in Canada should have installed one of these plants.

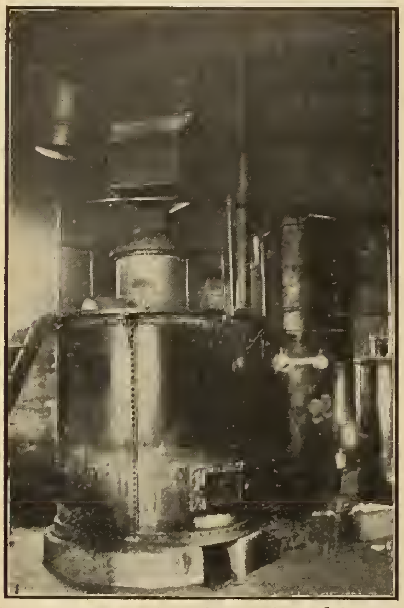


Fig. 1—Weber Producer Gas Plant at McClary's.

The plant consists of a three cylinder vertical gas engine, operated by gas supplied by a suction gas producer, designed to operate on anthracite pea coal.

The engine has a normal capacity of 200 b.H.P. and is direct connected to a 125 K.W. generator. The engine and producer were supplied by the Weber Gas Engine Co. The generator, which is specially built for direct connection to the gas engine, was supplied by the Canadian Westinghouse Co.

The producer gas plant is used as an auxiliary to the steam plant originally installed. The arrangement is such as to allow the gas engine driven generator to be run in parallel with the steam engine driven unit, and when desired either can be operated separately.

A handy coal handling device has been designed to feed the gas plant. This is shown in the illustration of the producer, Fig. 1. The coal is handled by a specially designed bucket. This bucket is hoisted on a runway to a point where it is discharged into the feed hopper on top of the producer, as shown in the illustration. This arrangement enables one man to handle the fuel with ease.

The starting of the producer involves a more efficient method than is ordinarily used on suction plants. The plant is started up in the usual way with a pressure fan near the producer. There is also an exhaust fan located in the engine room which draws the gases through the pipes leading from the producer to the engine until the pipes are filled with gas of good quality, which is indicated by the color of the flame when the gas is burned at the test cock. The plant is then ready to start. Thus the engine receives a good quality of gas at starting.

The engine is started by means of compressed air; the air being supplied by a motor-driven air compressor and stored in a tank. The air is admitted to one cylinder only, and is controlled by an automatic air valve, operated by a cam on the valve cam shaft.

The engine is governed quantatively, the governor being the ball type acting on a valve which regulates the quantity of the mixture admitted to the cylinder.

The water supply for the plant is taken from a large concrete cistern, and is pumped up into an elevated tank, situated in the roof of the building. Both engine and producer are supplied from this tank, which is connected with the city service through an automatic valve, so that it will be kept full should anything go wrong with the water supply from the cistern.

The hot water from the engine jacket is discharged into a tank in the condensor pit, and the boilers are fed from this tank, thus recovering some of the waste heat units from the gas engine.

It might be mentioned that the cistern referred to is supplied by gravity from the pipe running from a small creek. This creek flows into the Thames River. Water is taken from the creek rather than the river in order to insure a supply of clear water, free from sediment.

The power plant was installed for the McClary Mfg. Co. under the supervision of J. C. Royce, consulting engineer, Toronto, who prepared the plans for the installation.

The fuel consumption with a good grade of pea anthracite, according to the engineer's test, will average in practice about 1.5 pounds of coal per brake-horsepower.

Something which might be mentioned in regard to the plant is the fact that existing conditions are very favorable for the installation of a producer gas plant. For instance, the water supply is adequate and handy, and the combination with the steam plant is very effective. It must be said also that the plant is well installed.

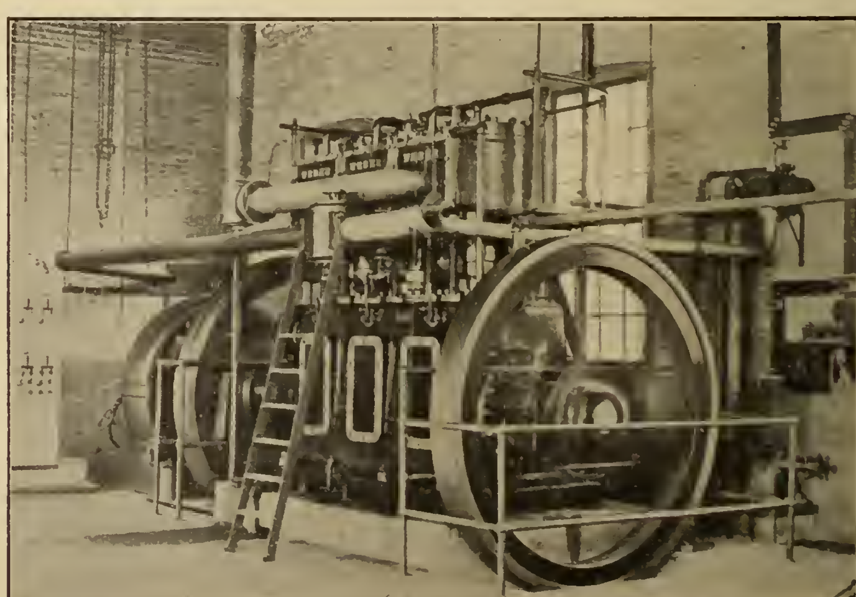


Fig. 2 Three Cylinder Weber Gas Engine at McClary's.

Hydro-Electric Commission's Report on Producer Gas

Cost of Producer Gas for Power as Reported by the Hydro- Electric Commission — Comparison with Steam and Hydro-Electric Power

The report of the Hydro-electric Power Commission regarding producer gas and other power agencies has been placed on the table of the Legislature in accordance with the suggestion of Hon. A. G. MacKay last session. Besides dealing with all kinds of gas powers, the report also gives some statistics regarding steam, and there is a general comparative summary. This summary states that users of small amounts of power will be best served by electricity where it can be obtained at a price per electric horse-power not exceeding by more than 15 per cent. to 25 per cent. the cost per brake horse-power developed by gas, gasoline or oil. Users of large amounts of power where the load fluctuates, says the report, will be justified in paying for electric power 30 per cent. more than the cost per brake horse-power obtained from gas gasoline, etc. The summary adds that where the cost of producer gas power per brake horse-power does not work out 15 per cent. below the cost of hydro-electric power per electric horse-power it will be advisable to use the latter.

An Intermediary Position.

The commission finds that producer gas plants at present are only advisable for those power users having a fairly steady load, and who acquire fairly large quantities of power, or who use gas for other purposes, such as annealing. Regarding the future it is stated that the increasing price of coal will probably allow producer gas plants to compete successfully with steam plants. This may even happen where exhaust steam is used for heating and manufacturing purposes. According to the commissioners, the producer gas plant will probably only occupy an intermediary position in the displacement of steam by hydro-electric power.

Some of the Figures.

Many pages of the report are taken up with tabulated statistics. It is found that with a 500 horse-power producer gas engine running full load for 3,000 hours a year(ten-hour day), the power costs $21.86 per horse-power per year. Under the same conditions, with a 100 horse-power engine, the cost is $27.32 per horse-power per year; with a 50 horse-power, $30.66; and with a 10 horse-power, $64.70. If the conditions are changed so that the engine works 6,600 hours a year the cost would be with 500 horse-power, $36.50 per horse-power per pear; with 100 horse-power, $45.54; 50 horse-power, $51.32, and 10 horsepower, $107.09.

The cost varies as the load varies, however, and in the report is a statement showing the cost when the engines are running at 75 per cent. of rated capacity. For the ten-hour day under such a load with a 500 horse-power engine the cost of the power used would be $27.43 per horse-power per year; 100 horse-power, $34.62; 50 horse-power, $39.58, and 10 horse-power, $84.37. Working 6,600 hours a year at the same load figures are: 500 horse-power, $45.22 per horse-power per year; 100 horse-power, $56.76; 50 horse-power, $65.56; 10 horse-power, $198.34.

How Cost is Made Up.

This cost includes fixed charges, maintenance and repairs, labor, anthracite coal at $5 a ton, oil, waste and sundries. The fixed charges include interest on capital, invested at 5 per cent.; depreciation in machinery, 6 per cent.; depreciation on buildings 2 per cent.; insurance and taxes, 2 1-2 per cent., and repairs on building 2 per cent.

The total capital cost, including building, etc., for a 500 horse-power producer gas engine is placed at $35,162, while for a ten horse-power engine it is $1,867. The maintenance account for 500 horse-power for a ten-hour day a year is placed at $618.24; labor, $1,200; and oil, waste, etc., $750. The fuel bill, of course, varies considerably with the load factor, though not proportionately. For a ten-hour day the engine running at full load the yearly fuel bill is given as follows: 10 horse-power, $93; 30 horse-power, $261; 50 horse-power, $390; 100 horse-power, $750; 300 horse-power, $2,250; 500 horse-power, $3,750.

Concerning Reliability.

To secure satisfactory results with producer gas, the commission report that it is necessary that a producer plant be suited to the conditions under which it works, that the type is selected and the plant installed under the supervision of a competent person independent of the selling agents, and that a trained man be placed in charge of it.

The commissioners also report that the average reliability of a large number of producer gas plants at present installed is not sufficient to admit of any comparison with that of the steam engine or electric motor.

Costs Not Based on Proper Load.

In the summary of F. T. Stocking, one of the engineers engaged in the investigation, it is pointed out that when costs are determined by small power users, the costs of fuel and attendance only are considered, while the charges against capital, repairs, failures of power, etc., are generally overlooked; and also that the load factor is generally neglected; costs are generally based on full load conditions, which in the average factory obtain only for a short time each day. He also said:

"A small gas plant, however, has the advantages over steam, in so far that no black smoke is emitted, costs for fuel and attendance are less, and also the total yearly costs, and the plant may be started, everything being cold, more quickly than the steam plant. The gas plant may be used to good advantage where continuity of service is not of prime importance, and where electric power cannot be obtained, or where the cost of such power is excessive."

Summary of Emil Stern.

Mr. Emil Stern, another engineer employed on the report, says in part:

"Up to the present time it is impossible to pass a final opinion regarding producer gas, gas producers and producer gas engines. Producer gas cannot be declared a complete success because many plants do not give satisfaction and are unreliable and expensive to operate, on account of high oil and water consumption, high wages, repairs and capital cost. But producer gas cannot be considered a total failure, because many plants have been in successful operation for years, they are absolutely reliable, the attendance, repair, fuel, water and oil consumption being low.

"Generally speaking, producer gas is being introduced slowly, but steadily. Like every new thing, it requires time for development and we may trust that it will shortly be allowed to take its part in Canada's power generation as it already does in England and other European countries, helping to increase the industry and manufacturing capacity of our country."

We are just finding out what Germany manufacturers long ago discovered, and that is that theory must precede practice.

Instead of pitching into work and taking advantage of momentum which would carry the job through, most of us approach it as if it had teeth and might bite.

INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News.

Electric Power and Transmission.

The new electric plant at Battleford, Sask., is in working order.

Several additions and changes will be made to the city electric plant, Victoria, B.C.

The municipal electric lighting plant at Tilbury, Ont., has been sold to Thos. Vickerman, at a cost of $2,750.

The ratepayers of Gananoque, Ont., have passed a by-law authorizing the expenditure of $10,000 for electric light extensions.

The Maritime Heat and Power Co., of Chignecto, N.S., has purchased the electric light plant of Sackville, N.B., and will operate it in future.

The application from Toronto for 10,000 horse-power from the Hydro-Electric Commission brings the total quantity orderes so far to 26,335 horse-power.

The council of Kenora, Ont., has applied to the Dominion Government for power to raise $75,000 for the completion of their hydro-electric power plant there.

A report from Creston, B.C., states that a project is on foot to develop power at Goat River canyon and that a company is now in process of organization.

London wants 5,000; Hamilton 1,500, Galt 1,200, Guelph 2,500, Woodstock 1,200, Brantford 1,500, Wnterloo 685, Berlin 1,000, New Hamburg 250, St. Thomas 1,500.

The citizens of Minnedosa, Man., expect soon to have a waterworks and power system combined, and an electric plant of not less than 600 horse-power may be erected in the near future.

The city council of Nelson, B.C., intend erecting a second transmission line from the municipal plant at Bonnington Falls to the city. Several minor additions and changes will be made to the plant.

At Bull river, East Kootenay, B.C., a large hydraulic power plant is under construction. The plant will have a capacity of 8,000 horse-power, and will furnish electrical power for mines and other purposes.

Brantford, Ont., city council, before making a contract with the Hydro-Electric Commission, will get tenders from competing companies, notably the Niagara Power Company and the Decew Falls Company, for power.

The town council, Galt, Ont., have decided to take 600 horse-power from the Hydro-Electric Commission. A canvass of the town showed a possible sale of 1,200 horse-power. A vote of $66,000 for a distributing plant has been passed.

The recently constructed transmission line of the Cape Breton Electric Company to North Sydney, N.S., was used recently for the first time, and from now on the residents of the town across the harbor are to be supplied with electrical energy generated in Sydney, N.S.

The city of St. Catharines have signed an agreement with the Falls Power Co. for city lighting at a rate of $39.50 per arc lamp, for a period of twenty-five years. This starts in August next. At present the Hamilton Cataract Power Co. is lighting the city for $72.50 per light.

General Manufacturing News.

A new wharf is to be erected at Moose Bay, Que., in the spring.

The Dresden Carriage Works, Dresden, Ont., will erect a building to cost $15,000.

The Brass & Steel Goods, Limited, have recently established a brauch at Belleville, Ont.

A refinery, which will cost $15,000, will be built in connection with the mint at Ottawa.

The Morris Brick Mfg. Co., Morris, Man., are proceeding with the completion iof their plant.

The Vancouver Furniture Co., Vancouver, B. C., recently opened their new factory in that city.

Barkey Bros., Stouffville, Ont., have started making brass valves and lumber measuring machines.

The tobacco factory of G. Jasperson, Kingsville, Ont., was destroyed by fire. Loss about $20,000.

The Goold, Shapley & Muir Co., Brantford, Ont., are installing a new galvanizing plant at their works.

W. M. Drader, Chatham, Ont., is considering the erection of a large factory for the manufacture of boxes.

A wharf is to be built at North Hotley, Que., as well as at Ayer's Cliff, on Lake Massawippi, this coming summer.

The Doty Engine Company, Goderich, Ont., have purchased a site and will at once start work on their new factory.

The Deseronto Iron Works, Deseronto, will shortly close down. Inability to secure charcoal is said to be the cause.

The Canadian Fish & Cold Storage Co., of Prince Rupert, B.C., will erect a cold storage plant at a cost of about $250,000.

A portion of the factory of the Modern Bedstead Co., Cornwall, Ont., was wrecked by the fall of the water tower. Loss $10,000.

The Ottawa Paint Works factory, with its up-to-date machinery equipment, valued at $15,000, has been completely destroyed by fire.

Mr. Fielding announced in his budget speech before the Dominion Parliament, that there would be no revision of the tariff this year.

The first consignment of machinery for the new brick plant of the Schelt Brick and Tile Co., Storm Bay, B.C., was shipped recently.

Fire destroyed the tannery, St. Helena St., St. Rochs, Que., with a loss of $10,000. A machinist shared the building with the tannery.

The Ontario Powder Company have started rebuilding the plant at Tweed, Ont., which was destroyed. The new buildings will cost about $25,000.

The premises of the Canada Screw Co., the Embroidery and Quilting Co., and D. J. Sinclair, Toronto, were damaged by fire recently. Loss about $10,000.

E. J. Cowan, of the Frontenac Mining & Smelting Company, was in Pittsburg endeavoring to arrange for the location of a smelting plant at Tweed, Ont.

An attempt will be made by Owen Sound, Ont., capitalists to organize a company to build and operate a dry dock at that place. W. P. Telford, M.P., is interested.

Messrs. Decorie & Lepage have opened up a place of business at 71a St. James street, Montreal, and will handle all contractors' supplies such as Portland cement, pipes, etc.

A telephone company is being organized in Debec, N.B., with a capital if $5,000, for the purpose of installing and operating a telephone system in York and Carleton counties, N.B.

A petition has been sent to the Dominion Government by the Boards of Trade of British Columbia asking that the lead bounties, which expire next spring be continued for five years.

The Aylmer Iron Works, Limited, Aylmer, Ont., have assigned in trust to E. R. C. Clarkson, Toronto, and winding-up order has been granted, Mr. Clarkson being provisional liquidator.

The premises of the King Edward hotel, the Alexander hall, the Empire Lumber Co., the post office, and several other buildings, Latchford, Ont., were destroyed by fire. Loss about $100,000.

According to the statement of C. H. Wilkenson, president of the British Columbia Development Company, no less than $250,000 will be spent by the company this year upon the irrigation of the Kootenay district.

The Canadian Road Machine Co., Hamilton, Ont., have bought the plant and business of the Good Roads Machinery Co., who went into liquidation some months ago. The new company expect to put the plant in operation immediately.

The King's Paper Box Co., of which Messrs. O. Constantineau, M. Langlois and L. H. Lefebvre are directors, will establish a plant at Maisonneuve, Montreal East, and will erect a $25,000 factory. The factory will employ from seventy to one hundred hands.

The British-Canadian Smelters Limited, Toronto, have decided to locate its large plant at Chippewa. The site is on the Niagara river and vessels having a 25-feet draught will be able to load. The company will employ 500 men and put up a plant for the treatment of metalliferous wastes ore and bullion.

The Snyder mill power at Port Elmsley, Ont., and also a large block of land, has been purchased by J. O'Connell, Ottawa, and graphite will be manufactured on a large scale. A small plant was established in the village last year, but now a lot of up-to-date machinery will be established and the industry will be carried on on a larger scale.

The American Can Company, after investigating the desirability of locating a factory in Montreal, have decided to spend $200,000 in erecting and equipping a can factory. The plant will be fully equipped with modern tools and appliances and work on the buildings will begin as soon as a site which affords proper railroad facilities has been obtained.

The Hamilton Steel & Iron Co., Limited, Hamilton, Ont., has issued a circular to its shareholders, announcing that pursuant to an arrangement entered into with the directors, a new company, identical with the old one, has been formed with a capital of $5,000,000; the shareholders being entitled to shares in the new company pro rata with their previous holdings.

A great lumber merger is announced in Winnipeg, under which five big companies, with an aggregate output of three billion feet, and a capital of ten million dollars, will amalgamate. The companies are the Red Deer Lumber Company, the Elk Lumher Company, the Sunset Lumber and Timber Company, the Yale Columbia Co., and the Bowman Lumber Co. They have seven complete outfits, including several of the best mills in western Canada.

Machine Shop and Foundry News.

The B. C. Electric Co., Vancouver, will operate a machine shop at Cedar Cove, B.C.

The Gilson Manufacturing Co., Guelph, will erect an addition to their machine shop.

The Canadian Steel Rolling Mills Company will erect a foundry at Campbellford, Ont., to cost $60,000.

The Capital Lock Nut Co., Columbus, O., will take over the plant of the Robertson Machinery Co., Welland, and will spend $100,000 in enlarging it.

A company is being orgnnized in Sydney, N. S., to establish a large machine shop in that town for making repairs to ships chiefly. It is understood that great success is being met with as far as capital is concerned.

A proposition has been placed before the town council, Arnprior, Ont., for the establishment there of the plant of the Malleable Iron Foundry and Machine Co., which was recently organized, with a capital of $100,000.

The Truro Foundry & Machine Co., at Truro, N.S., has been reorganized, with a capital of $100,000, all common stock, at $100 a share. Among those named as provisional directors are William J. Kent, lumberman; Andrew J. Campbell, barrister, Truro, and Ernest Crowe, lumberman, of Clifton.

Railway and Marine News.

The Grand Trunk Railway Co. will extend their yards at London, Ont.

Track-laying has been completed on the C.P. R. line from Lanigan to Saskatoon, Sask.

The Mutual Steamship Co., Port Coldwell, will place a new steamship on the Montreal lakes route.

It is proposed to build an electric railway from Prescott to Brockville, Ont. J. B. Ganghin, Brockville, is interested.

The Windsor, Chatham and London Railway Co. have had their Dominion charter renewed in spite of strong oposition from some quarters.

The C.P.R. during the coming summer will erect two large bridges in New Brunswick, one at Upper Woodstock, and the other at Grand Falls.

It is reported from Brantford, Ont., that the Grand Valley Railway (electric) are in the market for several cars, and possibly an electric locomotive.

The Northern Navigation Co. closed a contract recently with the Collingwood Shipbuilding Co. for a passanger and freight steamer for service on the great lakes.

A 70-mile extension of road will be built by the Spokane International Railway from Eastport to Fernie, B.C., where it will connect with the Canadian Pacific Railway.

It has been suggested in the Dominion Parliament by Mr. Graham that the Welland canal be deepened, and the I.C.R. should be double-tracked from Moncton to Halifax.

Tenders have been invited by the Grand Trunk Pacific for the construction of the terminal station at Winnipeg; and work will be started on the structure as soon as spring opens up.

A. Wallace, shipbuilder, Vancouver, proposes expending $250,000 in the erection of large marine ways at North Vancouver, B.C., for the dry-docking of vessels, at a cost of $250,000.

The car barns of the Hamilton Street Railway Co. were recently destroyed by fire, together with three cars. The loss is estimated at $80,000. These barns will be rebuilt at once.

A contract for the laying of about 100 miles of track for the G.T.P. from Prince Rupert

through the Rocky Mountains will be let in the near future at an approximate cost of $8,500,000.

The British Columbia Electric Railway Company, New Westminster, is calling for tenders for the erection of a large addition to the car shops which will double the capacity of the works.

Plans are now being prepared and construction will be started within the next few months of a new tipple for the Crow's Nest Pass Coal Co., Michel, B.C. The structure, when completed, will cost about $200,000.

Four more modern up-to-date interurban cars, two work cars and twenty city cars, the whole valued at approximately $200,000, is the output outlined for the B.C.E.R. car shops, of Vancouver, B.C., for the present year.

A new railroad, the Quebec & Saguenay, connecting Ste. Anne de Beaupre and Tadousac, a distance of 120 miles, will be started this year. A syndicate composed chiefly of Montrealers, with a capital of $5,000,000, has been formed to construct it.

Work will he commenced shortly on the railway line necessary to connect June group of mines, near Victoria, B.C., with the southeast arm of Quatsino Sound. These mines are owned by L. S. Lippy, Seattle; Wm. Grant and Harold Grant, Victoria, B.C.

The Alberni, Esquimalt and Nanaimo Railway, which is controlled by the C.P.R. and serves the coal regions in Vancouver, is to be extended from Wellington, B.C., its present northern terminus, to Alberni, the long-established seat of a great saw mill industry.

The firm of Foley, Walsh and Stewart, Winnipeg, signed a contract on March 19 to complete the line of the Grand Trunk Pacific from Prince Rupert, on the Pacific coast, to a point one hundred miles distant on the bank of the Skeena river. This involves an expenditure of between five and ten million dollars.

Considering difficulties encountered good progress is being made in the construction of the Kitamat branch of the Grand Trunk Pacific, according to J. H. Harstone, superintendent for Contractors Foley, Welch and Stewart. Harstone says that the big undertaking of building the road from Kitamat or Tidewater to Copper River, a distaoce of fifty miles, was completed a fortnight ago.

The Great Lakes Transportation Companies are preparing to launch a fleet of thirty new vessels to meet the expected increase in traffic for 1908. The aggregate carrying capacity of these ships will be 204,700 tons per single trip, and their total cost will be about $9,750,000. This daes not include, however, the passenger boat, City of Cleveland, burned last winter in Cleveland, which is being rebuilt at a cost of $1,000,000.

There is a bill now before the Dominion Parliament concerning the Northern Empire Railway Co., providing for construction of a railway from a point on the international boundary east of Cardston in Alberta, north through Lethbridge to Fort McMurray, to a point between British Columbia and Yukon Territory, thence by way of Dawson City to a point on the international boundary between Yukon and Alaska. There is also proposed a branch line from a point on the main line east of Victoria to city of Edmonton.

The Railway Commission Board, on request of the council, Walkerton, Ont., have sent one of their engineers to Walkerton to inspect and report as to the probability of the wooden bridge the C.P.R. has built across the river, causing an ice-jam when the ice goes down the river in the spring. The structure is not in accordance with the plan agreed to by the town, and endorsed by the Commission, and it is expected orders will be given to remove it at once. The same style of bridge is being erected at Hanover, Ont., on the same line.

James J. Hill has scores of engineers busy in a stretch of country 1,400 miles long, from Brandon, Manitoba, to Calgary, Alberta, and is said to be preparing a parallel road to the Canadian Pacific system throughout that district. Two years ago Mr. Hill made elaborate preparations for this scheme, but withdrew his forces because of depression. He has owned for four years large sections of land in three provinces. His headquarters are said to be at Medicine Hat, where lines radiate far north to Edmonton, Alberta.

Hon. G. W. Ross in the Senate has urged that some Government action should be taken to stop the present practice of having railway charters renewed from time to time when no substantial expenditure on construction had taken place. He stated that nineteen charters had been renewed last session, and thirteen bills for charters had come before the Senate this year. Charters had been renewed which had been granted as far back as 1884. Often charters were largely speculative, and stood in the way of legitimate enterprise. If the holders of charters were given to understand that unless they took action to give their charter effect it would not be renewed the present conditions would be remedied.

Waterworks and Sewerage.

The pumping station of the Canadian Northern Railway Co., Emerson, Man., was destroyed by fire February 26.

The North Shore Power Co., Three Rivers, Que., will install a new pump with a capacity of two million gallons daily.

It is proposed to lay a new water main from Atwater avenue to De Lorimer avenue, Montreat, at a cost of $180,000. It has received the approval of the water committee.

A 2,500,000-gallon turbine pump, with electric motor, is required for the Vancouver waterworks, and M. Peterson, secretary of the Board of Control, will receive tenders for supply of same. Specifications at office of H. N. Ruttan, city engineer.

Building News.

A new central school will be erected at Paris, Ont., to cost $45,000.

The Baptists of Hamilton will build a new church to cost about $20,000.

A new Anglican church will be erected in Merrickville, Ont., this summer.

A new public school will be erected at Lethbridge, Alta., at a cost of $85,000.

Wesley Methodist College, Winnipeg, will build a new ladies' building to cost $100,000.

A new Presbyterian church is to be erected at Marsboro, Que., during the coming summer.

Negotiations are going on for the erection of a summer hotel in Morristown, Ont., this summer.

The plans for a new brick post office and customs house at Cookshore, Que., have been prepared.

A new Y.M.C.A. building will be erected at Vancouver in the near future at a cost of about $250,000.

Six new rooms will be added to the Harbord street Collegiate, Toronto, this year, at a cost of $60,000.

The Westmoreland avenue church, Toronto, recently destroyed by fire, will be rebuilt at a cost of about $35,000.

Pembroke, Ont., is to have a Carnegia library, the great philanthropist's offer of $12,000 having been accepted.

The Canada Life Assurance Co. will erect a handsome brick building in Vancouver this year at a cost of $250,000.

A syndicate composed of Toronto men is being formed to erect an apartment house on Carlton street to cost $100,000.

Between $40,000 and $75,000 is the approximate estimate for the erection of the new Technical school now being considered for Hamilton, Ont.

It has been decided to erect an auditorium on the front of the College Street Methodist church, Toronto. The cost will be about $20,000.

The Montaguard A.A.A. will erect a pavilion on St. Catherine street, west, to be used as a skating rink in winter and a roller rink in summer.

The Royal Trust Co. have purchased the Alliance building, Montreal, for $350,000. It is stated they will erect a new office building in place of the present structure.

A church and Sunday school will be erected by the Anglican church at Winnipeg during 1908-09, at a probable expenditure of $125,000. The proposed edifice provides for classrooms and a first-class gymnasium.

A site has been chosen for the new technical school for Montreal. The Quebec Government is covering the $200,000 issue of bonds required for construction and maintenance, and the civic authorities of the city will pay $15,000 towards maintenance.

Municipal Undertakings.

$44,380 is recommended by the hoard of works, Hamilton, Ont., for gas, arc and Nerst lamps.

The ratepayers of Napanee, Ont., have passed a by-law authorizing the expenditure of $10,000 for additions to the present electric light plant.

Mr. Palmer, owner of the electric light plant of Brussels, Ont., states that he will make extensive improvements to the plant and transmissions lines at once.

The town clerk, on behalf of the council of the town of Tillsonburg, Ont., is now ready to receive estimates on a suitable electric light generating and distributing plant for the town.

The ratepayers of Goderich, Ont., have passed a by-law authorizing the guaranteeing by the town of $150,000 in bonds of the proposed Ontario and West Shore Electric Ry. Co. The company will at once proceed with their plans.

The ratepayers of Prince Albert, Sask., have passed a by-law authorizing the expenditure of $50,000 for the extension of the electric light plant and the waterworks system and the purchase of additional fire apparatus.

At a meeting of the Edmonton city council, held on March 4, a contract with the Canadian Machine Telephone Co., for an automatic telephone system, was cancelled, the reason given being failure to live up to agreement re delivery.

Tenders will be received up to April 25, 1908, for the construction of a landing pier at St. Pierre Les Becquets, Que., according to plans which may be seen at the office of J. L. Michand, resident engineer, Merchants Bank building, Montreal, or at the Public Works, Ottawa.

Trade Notes.

The Dominion Bridge Company, Montreal, has secured the contract for the steel superstructure of the Redwood bridge across the Red river at Winnipeg.

The Structural Steel Company, Montreal, has been awarded the contract for erecting the C. P.R. elevator, D. at Fort William.

The Canadian General Electric Co., Toronto, have been awarded the contract for the power plant for the I.C.R. yards at Stellarton, N.S.

The Hutton Electric Co. have just installed at the Arlington mines, near Slocan city, B.C., a complete electric lighting plant, including a 25 k.w. 500 volt water-driven dynamo.

The Transcontinental Railway have the Clark automatic nutlock in use on their Winnipeg division. The Canadian Northern have also placed an order for the Clark automatic nutlock.

Among the sales of riveting machines recently in Canada by John F. Allen, are: Manitoba Iron Works, Winnipeg; Dominion Bridge Co., Montreal, Que., and Wm. P. McNeil, New Glasgow, N.S.

Robert Hamilton & Co., Vancouver, B.C., have recently secured an order from the Fraser River Saw Mills, Limited, for sixteen new boilers, each 72 inches by 18 feet, of Goldie & McCulloch manufacture.

At the annual meeting of the Dominion Wire Rope Co., Ltd., Montreal, the following officers were elected for the ensuing year: F. H. Fairman, president; F. H. Hopkins, vice-president, and managing director; and J. J. Rosevear, secretary and treasurer.

The Dodge Manufacturing Company, Toronto, have bought property and buildings on St. Paul street, Montreal, from the Massey-Harris Co., Ltd., and will move their warerooms from St. James street to the newly acquired property on St. Paul street.

The large stove plant of the Wehrle Co., of Newark, Ohio, have recently installed a three-motor electric traveling Northern crane of about 50 feet span. The crane is to be used in their storage warehouse and this is one of the first stove plants who have made use of electric cranes for handling their finished product. This crane is of special design and was built by the Northern Engineering Works, of Detroit, Mich.

The Smart-Turner Machine Co., Hamilton, have supplied the following with duplex steam pumps: Doty Engine Works, Goderich, Ont.; Polson Iron Works, Toronto; Normal School, Hamilton; Valley City Seating Co., Dundas, Ont.; Dufresne & Lock, Montreal; Robb Engineering Works, Amherst, N.S.; Jas. Playfair Co., Midland, Ont.; and have received the following orders; Brechtels, Ltd., Waterloo, Ont., feed pump; Georgian Bay Engineering Works, Midland, Ont., jet C. condenser; E. Long Mfg. Co., Orillia, Ont., duplex pump; Grand Trunk Railway, two feed pumps.

The British Columbia Electric Railway Co., of Victoria, B.C., are installing a complete water system for fire protection, using standard hydrants and nozzles, on their properties in that city, and have purchased from Allis-Chalmers-Bullock at Vancouver an eight-inch two-stage Worthington turbine pump direct connected to a 150 h.p. 2,200 volt, three-phase, 60 cycle Allis-Chalmers-Bullock induction motor, also an electric driven dry vacuum pump. This outfit will readily handle 1,000 imperial gallons per minute and salt water will be used throughout the system.

At the annual meeting of the Canadian Oil Co., the old board of directors were elected, with the exception of E. R. Clarkson, whose place is taken by W. Ramsay, of Hamilton. Another vacancy, created by a resignation some six months ago, was filled by the election of H. B. Smith, of Owen Sound. At a subsequent meeting of the directors Mr. Calvert was elected president, and Messrs. J. J. Main, of Toronto; Mark Jamieson, of Warren, Pa.; Jas. Playfair and John Kerr, of Petrolea, vice-presidents. John Kerr, of Petrolea, was re-elected treasurer. W. P. Bull was also re-elected secretary; general manager, T. H. Hamilton.

Mining News.

More new machinery is being installed at the Granby Smelter, B.C.

More than 200,000 tons of iron ore were mined in Ontario during 1907.

The British Columbia Copper Co. is installing a new Rand duplex air compressor at the Mother Lode mine.

Bathurst, N.B., will be the site of the smelting works which the Drummond Mines Co. are going to erect, if suitable arrangements can be made with the municipality.

The Perry Creek hydraulic mine, near Cranbrook, B.C., has been sold to the Illinois Steel

Co., of Chicago, for $900,000, the original owners retaining $100,000 interest in the mine.

It is expected that the plant of the Nelson Electric Smelting Co., Nelson, B.C., for the handling of zinc ore will be in operation in the latter part of March or early in April.

The first shipment of coal from the Diamond Vale coal and iron mines, of Coutlee, B.C., has been received at the Pacific coast. This company spent $100,000 in 1907 for buildings and equipment. The coal is bituminous and high class.

The Nova Scotia Steel and Coal Co. have reported a new vein of iron ore at Whycocomagh Bay, which is said to assay about forty-nine per cent. The company intend to build a tramway to enable them to ship the ore to their plant at Sydney Mines.

Structural Steel Construction.

Tenders for a new graad stand on the Montreal baseball grounds will be called immediately.

The Department of Public Works, Ottawa, will erect bridges over the White river, at Englehart and Hilliardton, Ont.

The Northern New Brunswick & Eastern Quebec Railroad Company are planning the erection of a bridge 3,500 feet long, at Restigouche, N.B., to cost $600,000.

A new steel bridge, it is said, will be built across the Chemainus river, B.C., one across the Nanaimo river, besides two between Duncan and Shawnigan Lake, and a smaller one at Raymond's Crossing.

Saw and Planing Mills.

J. R. Murphy, sash and door manufacturer, Vancouver, B.C., has been succeeded by the Fairview Mfg. Co.

The Mispec Pulp Mill Co., St. John, N.B., may double the capacity of their plant, at a cost of $100,000.

The Moresly Island Lumber Company, Vancouver, will shortly commence work on the construction of a $350,000 sawmill.

W. E. Simpson, of Iowa Falls, Iowa, and other American associates, organized as the North American Timber Co., have acquired large timber holdings on Vancouver Island and elsewhere on the coast, and will enter upon the construction of a large sawmill this season at Kennedy Lake, B.C.

P. Lund, of Wardner, B.C., is building at Marysville, just north of Cranbrook, B.C., a new circular sawmill that will have a capacity of about 40,000 feet per day. It is understood that much of the output of this mill will be railroad ties. The machinery equipment has been supplied by the Waterous Engine Works, of Brantford, Ont.

Companies Incorporated.

E. R. Burns Saw Co., Toronto ; capital, $50,000 ; to manufacture and deal in saws of all kinds. Provisional directors, A. W. Holmestead and F. H. Potts, Toronto.

L. C. Prince Co., St. John, N.B.; capital, $99,000 ; to manufacture and deal in lumber and timber. Provisional directors, L. B. Knight, F. R. Taylor, both of St. John.

Coon's De Marvel Co., Toronto ; capital, $40,000 ; to manufacture insulators, transformers and resistance coils. Provisional directors, W. R. Bird, R. Verity, A. F. White, all of Toronto.

Toronto Fireproofing & Concrete Co., Toronto ; capital, $40,000 ; to manufacture cement, brick, tile and stone. Provisional directors, W. E. Denise, E. Lake and J. A. Jackson, all of Toronto.

Ontario Limestone and Clay Products, Belleville, Ont.; capital, $50,000 ; to manufacture lime, brick, clay. Provisional directors, F. R. Lingham, L. E. Allen and S. Mason, all of Belleville.

Imperial Stove Works, Morrisburg, Ont.; capital, $100,000 ; to manufacture stoves, electrical machines and implements. Provisional directors, J. Ferguson, Morrisburg, and S. Coons, Winchester, Ont.

Peerless Motor Specialty Co., Ottawa ; capital, $40,000 ; to manufacture and deal in motor cars, boats and engines. Provisional directors, B. H. Sills, J. Lumsden and J. L. MacCracken, all of Ottawa.

Chaudiere Basin Power Co., Montreal ; capital, $150,000 ; to develop and sell electrical power and deal in timber of all kinds. Incorporators, F. H. Manley, J. F. McKenzie and G. P. Grant, all of Montreal.

W. A. Russell Co., Portage la Prairie, Man.: capital, $50,000 ; to manufacture furniture paints, leather goods and machinery. Provisional directors, W. A. Russell, G. E. Bona and W. P. Rundle, all of Portage la Prairie.

The Gallimard Simplex Turbine Co., Montreal ; capital, $250,000 ; to acquire the rights for the Simplex Turbine and to deal in machinery of all kinds. Incorporators, P. Gallimard, E. Leclerc, both of Montreal.

Oldsmobile Company of Canada, Toronto ; capital, $40,000 ; to manufacture and deal in motor cars and machinery of all kinds. Provisional directors, F. Sager, Toronto ; F. L. Smith and F. G. Seitz, of Lansing, Mich.

Minneapolis Steel and Machinery Co., Minneapolis, Minn., have been granted an Ontario license, and will manufacture and deal in machinery and structural iron. J. F. Orde and M. G. Powell, of Ottawa, are the company's solicitors.

J. and R. Weir, Ltd., Montreal, with a capital of $100,000, has been incorporated. The company consists of J. C. Weir, R. S. Weir, G. Weir, J. J. Meagher and J. E. Coulin, of Montreal. They will continue the business of J. & R. Weir as engineers, boiler makers, founders and machinists, and to deal in motors, steam engines, boilers, gas and gasolene engines.

Are Enlarging Machine Shop.

The Selkirk Machine Works, Selkirk, Man., are enlarging their premises, and will be equipping their machine shop with modern tools. This company do general repair work and special work for Lake Winnipeg steamship trade.

New Machine Shop in Guelph.

F. H. Coleman has opened up a machine shop at 50 Cardigan street, Guelph, Ont. Considerable new machinery has already been installed. Mr. Coleman will do general repair and tool work, as well as manufacturing a line of portable forges, small drill presses and Coleman's power hack saw and filing machine.

More Equipment Needed.

The Pere Marquette shops in St. Thomas, Ont. are very busy on repair work; and it is found that the present equipment will have to be increased. A new steam hammer is being installed at the present time, and more machinery will be needed in the near future.

To Equip Manufacturing Plant.

E. C. Atkins & Co., saw manufacturers, Hamilton, Ont., have purchased the buildings and property on Sherman avenue, N., Hamilton, belonging to the Cataract Power Co. The Atkins Co. will immediately equip this factory with a full line of machinery. The Pittsburg Perfect Fence Co. are occupying part of the premises at present. However, it is probable that they will be obliged to move in the near future, which fact will make it necessary for this firm to erect new buildings.

G.T.P. Expenditure.

Reviewing the expenditure on the Transcontinental Railway (eastern division) Mr. Fielding, in his budget speech, gave the following figures which the Government had spent in the last four years : 1904, $6,249 ; 1905, $778,491 ; 1906, $1,841,269 ; 1907, $5,537,867; making a total of $8,163,878. Adding the estimates for the current year he went on to say that the Government would have spent on this work at the close of the present fiscal year, $26,000,000.

To Reduce Test of Alcohol for Industrial Use.

It is being advocated in the Dominion Parliament that a commission should be appointed to enquire into the report on a method by which alcohol can be generally used in scientific and industrial operations without increasing the danger of its use as a potable spirit. The idea is to reduce the customs duty on alcohol for manufacturing purposes to 25 cents per gallon, and to do away with the exise duty.

The United States Government have gone very fully into this question, and have investigated the commercial uses of denatured alcohol. Very full reports on denatured alcohol as a fuel for gas engines have been issued.

Doubling Cement Plant.

At the annual meeting of the International Portland Cement Co., Hull, Que., it was decided to take steps to double the capacity of the factory. J. S. Irvin, managing director, reported that the orders were far in excess of the production and that prospects for 1908 were promising. Mr. Irvin, in his report said :

"We have already sold for spring and summer delivery nearly one hundred per cent. more cement than we sold this time last year ; in fact, we have never booked orders for so much cement at this period of the year during our experience in the business."

Special Machinery Company Started.

The Special Machinery Mfg. Co., Montreal, has been registered. Messrs. Louis Engelhorn, John Vanderslice, M.E., J. Raymond Beaudry constitute the company, with John J. Lees as superintendent. They have opened up a commodious office on the corner of St. Paul and St. Nicholas streets. Their present workshop is found too small and larger quarters have been obtained on St. Paul street. They will design and build mechanical and scientific apparatus, specializing in fine mechanisms, instruments, dies and developments of inventions. They will act as agents for several special lines, including the script weight recorder, which will shortly be placed on the Canadian market.

Looks Like An Electric Merger.

The Toronto street railway, the Toronto suburban railways, the Winnipeg street railway, electric railways in Niagara district, the Electrical Development Co., are all controlled by one man. It is rumored that he is trying to secure a controlling interest in the Toronto Electric Light Co. It is also said that there is machinery at work to amalgamate the power companies at Niagara Falls. That looks like an electric merger. It is natural that a man with vast railway interests should desire to secure controlling interest in electrical power, especially in view of the tendency to electrify steam roads.

Some day it will be desired to run trains by electricity on the Canadian Northern. Electrical power would come in very handy then.

Foreign Agencies for Allen Riveters.

Some recent notable connections have been arranged by John F. Allen, 370-372 Gerard avenue, New York city, to push the sale of the "Allen" riveting machines abroad.

An agency has been established at Vienna to build up the Austrian trade.

Robert Lindenthal has opened an office in Berlin, intending to cover Germany thoroughly.

Samuel Ranko has taken over the sale of "Allen" tools in Russia, establishing an office at Cherson, the capital of Odessa, the expectation being that within a very short time he will secure a good size order from the Government which has outlined big expenditures for bridge and other steel structural work.

Edwardo Catrasco, Santiago, Chili, has taken the agency for that country.

Previously established agencies are, Fenwick, Freres & Co., Paris ; John Turnbull, Jr., Glasgow, and V. Lowlner, Co., Copenhagen.

G.T.P. Should Be Completed As Soon As Possible.

Mr. Fielding in his budget speech before Dominion Parliament urges that the Transcontinental Railway be completed as soon as possible. The following is a quotation :

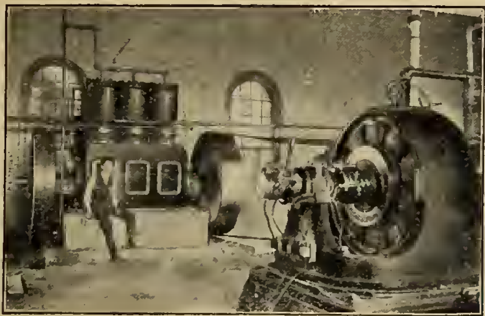
"On the part of the Government it is a time for caution, and yet a time for courage. Large new enterprises, which would call for great outlays, may well be laid aside for a little while, but works which we already have in hand and perhaps other works not calling for heavy outlay, must not be neglected. Particularly must we not fail to push forward the great enterprise of the Transcontinental Railway. We have reached a stage in that enterprise which calls for heavy expenditure. Yet we feel it our duty to urge upon the commissioners the prosecution of the work, so that the new road may be completed at the earliest possible date."

Canadian Crocker-Wheeler Co., Limited.

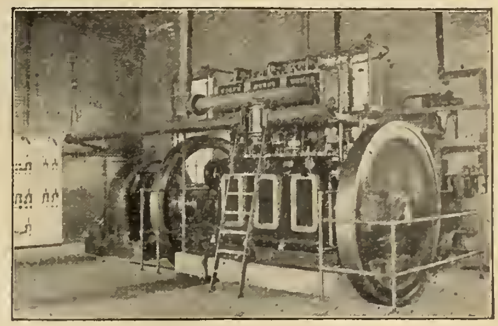
Another promising sign of returning confidence in the business situation is the organization of the Canadian Crocker-Wheeler Co., Ltd., for the manufacture and sale in Canada of the well known Crocker-Wheeler electrical apparatus. The officers of the company are as follows : Fritz E. Lovell, president ; R. A. Stinson, vice-president, and F. Jno. Bell, secretary-treasurer.

The head office is located in the Street Railway chambers, Place d'Armes Hill, Montreal, but the place of manufacture in Canada has not yet been decided upon.

The Crocker-Wheeler Co. manufactures all



125 H.P. WEBER GAS ENGINE
Belt driving a 75 K.W. Alternator.



250 H.P. WEBER GAS ENGINE
Direct connected to 150 K.W. D.C. Generator.

WEBER GAS ENGINE

—AND—

SUCTION GAS PRODUCER

USES COAL, COKE, CHARCOAL, LIGNITE

Sizes 30 to 350 H.P. Units. Ask for Catalog 22.

We furnished McClary Mfg. Co., London, Ont., Power Plant described in this issue.

HIGHEST AWARD

ESTABLISHED 1884. PRODUCER
WEBER
GAS GASOLINE ENGINES AND HOISTS

GOLD MEDAL

FUEL CONSUMPTION GUARANTEED

REGULATION OVERLOAD GUARANTEED

BELTED or DIRECT CONNECTED for driving ALTERNATING and DIRECT CURRENT GENERATORS, Flour Mills, Water Works.

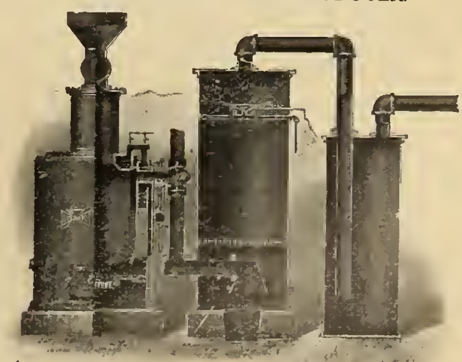
OUR BROCHURE 55 TELLS THE HOW AND WHY. ASK FOR IT.

Ask Nancy Helen Mines, Cobalt, Ont., about the satisfactory performance of their Weber Gas Power Plant.

250 H.P. WEBER GAS ENGINE
Direct connected to 175 K.W. Alternator.

WEBER Gas Engine Co.
BOX 415
Kansas City, Mo., U.S.A.

SECTIONAL VIEW
WEBER SUCTION GAS PRODUCER.



types of direct current and alternating current motors and generators, power transformers, motor generator sets, frequency changers, etc. Some of their best known lines being direct current motors for special purposes, such as machine tool and printing press drive, and steel mill work. For steel mill work a special line of motor has been developed which has fully met the very severe conditions which exist in steel mills. The Crocker-Wheeler alternating current generators, up to 2,000 k.w. capacity, have been in successful operation in Canada for some years.

Atlantic, Quebec and Western Railway.

This company is spending $6,000,000 on the 202 miles between Metapedia, N.B., and Gaspe basin, and have purchased the old Baie des Chaleurs line, have constructed 20 miles to Port Daniel and have 80 miles under construction. The Baie des Chaleurs line cost $2,000,000, and another million will be spent improving the roadbed and reducing the curves.

Over 800 men have been employed on the 80 miles from Port Daniel to the terminal at Gaspe basin, and this number will be increased in the spring. One of the important works will be the construction of an 850-foot tunnel through limestone rock at Cape l'Enfer. There are 26 bridges on the lower section of the Atlantic, Quebec & Western, and all of these will be built of steel and concrete at a cost of a million dollars.

The company, of which Lord Templeton is president, and Lord Ranfurly and J. X. Lavoie are vice-presidents, expect to make of Gaspe another winter port. The passenger station at Gaspe Basin will be located at the foot of Fort Ramsey, and the freight sheds at Sandy Beach about four miles from the passenger station. Wharves will be built at Gaspe and it is proposed to erect a series of hotels at Gaspe, Carleton, New Carlisle, Perce and other places along the coast.

Testing Laboratories Established in Toronto.

The Toronto Testing Laboratory, Ltd., Toronto, have been incorporated, and have established an office in the Saturday Night building. This is a company of analytical and consulting chemists, their specialty being looking after the requirements of iron and steel foundries and steel manufacturies. They also carry on the assaying of ores.

The officers of the company are as follows:—President, J. D. Stoddard; vice-president, W. P. Putnam; secretary, Henry Blumhart; treasurer and manager, Hugh Lamont.

This company was formed to look after the Canadian business of the Detroit Testing Laboratory, and although the company is a separate and distinct one, the management and shareholders are practically the same.

Mr. Lamont, who will manage the Canadian business, has had many years' experience in handling analytical work in foundries and has been connected for the last few years with the Detroit Testing Laboratory.

As a result of establishing this Canadian company, more prompt service can be rendered than was the case when the business was handled from the Detroit office.

To Give More Protection to Canadian Shipbuilders.

In view of the article appearing in last issue of Canadian Machinery, on the Canadian shipbuilding industry, the report from Ottawa that the Government will amend tariff regulations so as to give Canadian shipbuilding firms greater protection, is of great interest. At present the Customs Department cannot legally collect the duty on any repairs made to vessels in American ports and subsequently making customs entry in this country. The result has been that many Canadian vessels, instead of going to Canadian dry-docks for repairs, give the business to American firms, for one reason or another, and absolutely no protection is afforded Canadian firms in this respect. Moreover, it has frequently happened that second-hand vessels are bought cheaply in American waters, repaired and brought to Canada, the duty collected being only on the amount of the purchase price. Then, again, Canadian shipbuilders are at the further disadvantage of having to pay duties on many items entering into the construction and equipping of vessels, the cost of "raw material" thus being enhanced without the compensating advantage of adequate protection against foreign competition on finished vessels. It is stated that the Government now proposed to amend the tariff law by making repairs to vessels dutiable. Such a course would protect shipbuilding firms in this country against foreign competition, would build up the industry here, and would work no hardship to vessel-owners, in view of the fact that there are now established in Canada several large and well-equipped dry docks capable of handling all the business that would be offered by the Canadian merchant marine.

Squabble Over Boiler Contract.

The civic authorities of Toronto have been having a warm time over boiler contracts during the last few weeks. The facts are briefly as follows:

The city council thought the engineer called for tenders for the pumping engines and boilers for the pumping station. The city engineer recommended that the tender of the John Inglis Co., Toronto, should be accepted. This contract specified Babcock & Wilcox boilers. The city council upon this recommendation accepted this tender.

As soon as this became known, J. J. Main, manager of the Polson Iron Works, wrote to the council claiming that the Hiene boiler, made by his firm in Toronto, was quite as good as the B. & W.; and asked that his boilers be used instead of B. &. W., because in so doing, work would be supplied to Toronto mechanics.

Some lobbying was done and the city council, without enquiring further into the case, decided that the tender of John Inglis should be accepted, but the B. &. W. boilers were to be changed to the Hiene.

This raised a storm in the engineering department, and the city engineer refused to take the responsibility if Hiene boilers were installed. The operating engineers at the Toronto waterworks claimed that their experience with Hiene boilers had not been satisfactory. The Babcock & Wilcox Co. threatened the council with legal proceedings. The council finally referred the whole matter back to the engineering department for a full report.

The Findings of the Quebec Bridge Commission.

The findings of the commission appointed by the Government to make a report on the Quebec bridge diaster is as follows:

(a) The collapse of the Quebec bridge resulted from the failure of the lower chords in the anchor arm near the main pier. The failure of these chords was due to their defective design.

(b) The stresses that caused the failure were not due to abnormal weather conditions or accident, but were such as might be expected in the regular course of erection.

(c) The design of the chords that failed was made by P. L. Szlapke, the designing engineer of the Phoenix Bridge Company.

(d) This design was examined and officially approved by Theodore Cooper, consulting engineer of the Quebec Bridge and Railway Company.

(e) The failure cannot be attributed directly to any cause other than errors in judgment on the part of these two engineers.

(f) These errors of judgment cannot be attributed either to lack of common professional knowledge, to neglect of duty, or to a desire to economize. The ability of the two engineers was tried in one of the most difficult professional problems of the day and proved to be insufficient for the task.

(g) We do not consider that the specifications for the work were satisfactory or sufficient, the unit stresses in particular being higher than any established by past practice. The specifications were accepted without protest by all interested.

(h) A grave error was made in assuming the dead load for the calculation at too low a value, and not afterwards revising this assumption. This error was of sufficient magnitude to have required the condemnation of the bridge even if the details of the lower chords had been of sufficient strength because, if the bridge had been completed as designed, the actual stresses would have been considerably greater than those permitted by the specifications. This erroneous assumption was made by Mr. Szlapke and accepted by Mr. Cooper, and tended to hasten the disaster.

(i) We do not believe that the fall of the bridge could have been prevented by any action that might have been taken after August 27th, 1907. Any effort to brace or take down the structure would have been impracticable owing to the manifest risk of human life involved.

(j) The loss of life on August 29th, 1907, might have been prevented by the exercise of better judgment on the part of those in responsible charge of the work for the Quebec Bridge and Railway Company, and for the Phoenix Bridge Company.

(k) The failure on the part of the Quebec Bridge and Railway Company to appoint an experienced bridge engineer to the position of chief engineer was a mistake. This resulted in a loose and inefficient supervision of all parts of the work on the part of the Quebec Bridge and Railway Company.

(l) The work done by the Phoenix Bridge Company in making the detail drawings and in planning and carrying out the erection, and by the Phoenix Bridge Company in fabricating the material was good and the steel used was of good quality. The serious defects were fundamental errors in design.

(m) No one connected with the general designing fully appreciated the magnitude of the work nor the insufficiency of the data upon which they were depending. The special experimental studies and investigations that were required to confirm the judgment of the designers were not made.

(n) The professional knowledge of the present day concerning the action of steel columns under load is not sufficient to enable engineers to economically design such structures as the Quebec bridge. A bridge of the adopted span that will unquestionably be safe can be built, but in the present state of professional knowledge a considerably larger amount of metal would have to be used than might be required if our knowledge were more exact.

(o) The professional record of Mr. Cooper was such that this selection for the authoritative position that he occupied was warranted, and the complete confidence that was placed in his judgment by the officials of the Dominion Government, the Quebec Bridge and Railway Company, and the Phoenix Bridge Company was deserved.

CATALOGUES OF THE TRADE.

GASOLENE ENGINES—A 20-page booklet illustrating engines for marine use made by the Guarantee Motor Co., Hamilton, Ont.

STEAM TRAPS—A 40-page catalogue of steam traps and boiler feeds manufactured by Morehead Manufacturing Co., Detroit, Mich.

PLANERS—General catalogue of the Cincinnati Planer Co., Cincinnati, O. [illegible] their planers for general and special work.

WATTMETERS—Circular 1137 of the Westinghouse Electric Co., Pittsburg, Pa., describing their integrating wattmeters for A.C. & D.C.

DRILL HOLDER—Pamphlet illustrating the standard metal drill holder and gauge, manufactured by the Standard Tool Co., Cleveland, Ohio.

LUBRICATING SPECIALTIES—Booklet of oil cups for use on all classes of bearings with Graphoil, manufactured by Graphoil Lubricator Co., N.Y.

DIARY—For 1908 from the Albany and North River Molding Sand Co., containing colored maps of different countries of the world. Malcolm McGregor, Montreal, agent.

INTERLOCKING STEEL SHEETING.—Booklet issued by George W. Jackson, Chicago, illustrating their interlocking sheeting for coffer-dams, piles and water-tight casings.

UNDERFEED STOKER—Bulletin for Jan. and Feb. from the Jones Underfeed Stoker Co., Ltd., Montreal, gives the latest sales list and illustrations of some of the latest installations.

ROLLER BEARINGS—Bulletin 105 of the Hyatt Roller Bearing Co., Newark, N.J., giving a report of a comparative test of ordinary babbit and Hyatt roller bearings. A useful book to have.

GAS ENGINES—Bulletin 1062 of the Allis-Chalmers-Bullock Co., Montreal, illustrating the power plant and sub-station installed by them for the Milwaukee Northern Railway, Port Washington, Wis.

RIVETERS—Pamphlet published by the Hanna Engineering Works, Chicago, describing their riveters for use in bridge and boiler works, portable reamers and shapers, both stationary and portable for use in the foundry.

LOCOMOTIVE CRANES—Catalogue issued by the Brown Hoisting Machinery Co., Cleveland, Ohio, describing their locomotive cranes for handling all kinds of loose material. This catalogue should be of special interest to railroad contractors.

TOOL STEEL—Booklet issued by Wm. Jessop & Sons, New York, giving tables of stock sizes of their tool steel, with complete directions for shaping and hardening. These directions are also printed on a card of convenient size for putting in pocket notebook.

RAILROAD SUPPLIES—A 14-page illustrated catalogue, pages 10x11 ins., from Bayliss, Jones & Bayliss, Ltd., 139 and 141 Cannon St., London, E.C., Eng., describes Bayliss railroad fencing, wrought iron works, railway fastenings,

bolts, patent nuts, patent "Helicord" lock nut, tie bars, etc.

STEAM GAUGES—Catalogue issued by the American Steam Gauge and Valve Manufacturing Co., Boston, Mass., describing their gauges, valves of all kinds and improved testing outfits, including steam engine indicators. The Canadian agents for this firm are the Canadian Fairbanks Co., Montreal.

TURRET LATHE—A neatly arranged catalogue describing the "Libby" full swing turret lathe. The principal features of this machine are its full overswing carriage, geared headstock, automatic feed trip-offs and quick change feed and cutters. Manufactured by the International Machine Tool Co., Indianapolis, Ind.

INDUSTRIAL RAILWAYS—Pamphlet No. 045 of C. W. Hunt Co., New York, illustrating their industrial railways for use in manufacturing establishments where material has to be moved from ane place to another. This method of moving heavy material has been found specially valuable in machine shops and foundries.

THERMIT WELDING—A large pamphlet of 26 pages illustrating thermit welding. A number of illustrations of successful welds on all classes of machinery are given and described. This process is specially applicable to engine and machine frames and bed plates. Manufactured by the Goldschmidt Thermit Co., New York.

REAMERS—Pamphlet describing the Smith one-lock adjustable reamer, manufactured by Wm. J. Smith Co., New Haven, Conn. This reamer can be adjusted for any size of work by simply removing a retaining screw and turning the adjusting cam. It specially commends itself for use where quick and accurate changes are desired.

INDUCTION MOTORS—Bulletin 301 of the Allis-Chalmers-Bullock Co., Montreal, describing their polyphase induction motors, with emphasis on their simplicity of starting, and durability of construction. This motor is capable of running for considerable time with an overload, thus making it suitable for work where such conditions prevail.

MACHINE TOOLS—Catalogue 45 of the Newton Machine Tool Works, Philadelphia, Pa., describing with illustrations their milling, shaping, planing and boring machines. Special aetention is called to their keyseat milling machines and various types of cold saw cutting-off machines for use in steel foundries. The entire catalogue is neatly arranged and is well worth having on hand.

BOOK REVIEWS.

GAS POWER—A complete manual of gas engines, their design and construction, the application of gas power to various industries. The rational utilization of low-grade fuels, the various types of fuels, the various types of producers, etc.; by F. E. Junge, M. A., C.E., M.E. 548 pages, 9x6 ins.; fully illustrated with a series of large illustations at the back. Published by the Hill Pub. Co., New York, and sold in Canada by the MacLean Pub. Co., Toronto. Price, $5.

This book gives a complete scientific account of the practical achievements which have been realized in the design, construction and application of gas engines, producers and power plants up to the largest sizes. It gives a detailed survey of the successful methods of utilizing blast furnace, coke oven and producer gases, as well as low grade coals and other waste, such as lignite, peat, bituminous coal, mine culm, dust fuels, etc., with a discussion of gas producers designed for their use.

A feature of the book is the treatment of the broad economic aspect of the gas power problem and its relation to the iron, coal and kindred industries.

CAMPBELLFORD TO HAVE STEEL PLANT.

The ratepayers of Campbellford, Ont., have voted favorably on the by-law to give the Canadian Steel Company a site of five acres and exemption for ten years and to supply them with power at $10 per horse-power. The vote was almost unanimous, being 280 for and 8 against the by-law. Campbellford council is developing five thousand horse-power, out of which it has sold the steel company fifteen hundred horse-power. The company will commence at once to erect buildings at a cost of $60,000, and will put in the largest steel plant in Ontario.

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SHOP LICENSES to manufacture a new style of files that can be easily sharpened when dulled. See description on page 25 of this issue. Henry Getaz, P.O. Box 292, Schenectady, N.Y. (5)

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B. CAIRNS, MANUFACTURER OF RUBBER stamps, stencils, steel stamps, burning brands. 77-79 Queen Street East, Toronto, Ont.

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SALESMEN WANTED to handle portable hand power metal punches, as side line, on commission, excellent profit. Frank Vander Bogart, Rockford, Illinois. (4)

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BY AN EXPERT on the design and construction of gas and gasolene engines and producer gas plants. Would take position as superintendent or general foreman with a company manufacturing gas engines or automobiles. Address Box 53, CANADIAN MACHINERY, Toronto. (4)

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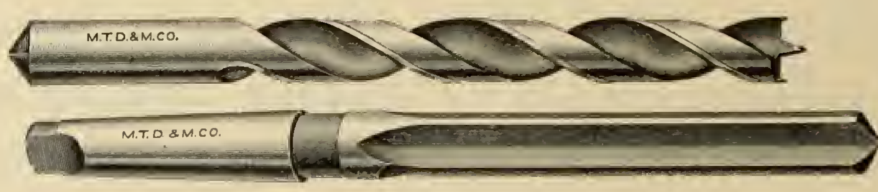

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Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Hartford, Conn.

Centres, Planer.
American Tool Works Co., Cincinnati.

Centrifugal Pumps.
Gas & Electric Power Co., Toronto
John McDougall Caledonian Iron Works Co, Montreal.
Pratt & Whitney Co., Hartford, Conn.

Centrifugal Pumps—Turbine Driven
Kerr Turbine Co., Wellsville, N.Y.

Chain, Crane and Dredge.
Frothingham & Workman, Ltd., Montreal

Chaplets.
Detroit Foundry Supply Co., Windsor.
Dominion Foundry Supply Co., Toronto
Hamilton Facing Mill Co., Hamilton
Smith, J. D., Foundry Supply Co., Cleveland Ohio

Charcoal.
Detroit Foundry Supply Co., Windsor.
Doggett, Stanley, New York
Dominion Foundry Supply Co., Toronto
Hamilton Facing Mill Co., Hamilton.
Smith, J. D., Foundry Supply Co., Cleveland, Ohio

Charcoal Facings.
Doggett, Stanley New York

Chemicals.
Canada Chemical Co., London.

Chrome Brick.
Harbison - Walker Refractories Co., Pittsburg

Chucks, Drill and Lathe.
American Tool Works Co., Cincinnati.
John Bertram & Sons Co., Dundas, Ont.
Canada Machinery Agency, Montreal.
Cleveland Twist Drill Co., Cleveland
Frothingham & Workman Ltd., Montreal
Hamilton Tool Co., Hamilton, Ont.
Jacobs Mfg. Co. Hartford, Conn
Ker & Goodwin, Brantford.
London Mach. Tool Co., Hamilton.
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.
Rice Lewis & Son, Toronto.
Standard Tool Co., Cleveland.

Chucking Machines.
American Tool Works Co., Cincinnati.
Lewis, Rice, & Son, Toronto
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.
Warner & Swasey Co., Cleveland, Ohio

Circuit Breakers.
Allis-Chalmers-Bullock, Limited, Montreal
Canadian General Electric Co., Toronto.
Canadian Westinghouse Co., Hamilton.
Gas & Electric Power Co., Toronto.

Clippers, Bolt.
Frothingham & Workman Ltd. Montreal
A. B. Jardine & Co., Hespeler, Ont.

Cloth and Wool Dryers.
Dominion Heating and Ventilating Co., Hespeler.
B. Greening Wire Co., Hamilton.
Sheldons Limited, Galt

Coal Boring Machines.
Cumming, J. W., New Glasgow, N.S.

Coal Handling Machinery.
Jeffrey Mfg. Co., Columbus, Ohio

Coal Miners' Tools.
Cumming J. W., New Glasgow, N.S.

Collectors, Pneumatic.
Sheldons Limited, Galt

Compressors, Air.
Allis-Chalmers-Bullock, Limited, Montreal
Canada Foundry Co., Limited, Toronto
Canada Machinery Agency, Montreal.
Canadian Rand Co., Montreal.
Canadian Westinghouse Co., Hamilton.
Darling Bros., Ltd., Montreal
Detroit Foundry Supply Co. Windsor.
Gas & Electric Power Co., Toronto.
John McDougall, Caledonian Iron Works Co Montreal
H. W. Petrie, Toronto.
The Smart-Turner Mach. Co., Hamilton.
Hall Engineering Works, Montreal Que.
London Mach. Tool Co., Hamilton.
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.
Pratt & Whitney Co., Hartford, Conn
Smith, J. D., Foundry Supply Co., Cleveland, Ohio
Williams & Wilson, Montreal.

Concentrating Plant.
Allis-Chalmers-Bullock, Montreal.

Concrete Mixers.
Jeffrey Mfg. Co., Columbus, Ohio.

Condensers.
Canada Foundry Co., Limited, Toronto.
Canada Machinery Agency, Montreal.
Goldie & McCulloch Co., Galt
Hall Engineering Works Montreal.
Smart-Turner Machine Co., Hamilton.
Waterous Engine Co., Brantford.

Consulting Engineers.
Connor, A. W., Toronto
Hall Engineering Works, Montreal.
Jules De Clercy, Montreal.
Roderick J. Parke, Toronto.
T. Pringle & Son, Montreal.
Taylor, James, Wine Harbor, N S.

Contractors.
Expanded Metal and Fireproofing Co. Toronto.
Gas & Electric Power Co., Toronto.
Goldie & McCulloch, Galt
Hall Engineering Works Montreal.
Laurie Engine & Machine Co., Montreal.
John McDougall Caledonian Iron Works Co., Montreal
Robb Engineering Co Amherst N S.
The Smart-Turner Mach. Co., Hamilton.

Contractors' Plant.
Allis-Chalmers-Bullock, Montreal.
John McDougall, Caledonian Iron Works Co., Montreal.
Niagara Falls Machine & Foundry Co., Niagara Falls, Ont.

Controllers and Starters Electric Motor.
Allis-Chalmers-Bullock, Montreal.
Canadian General Electric Co., Toronto.
Canadian Westinghouse Co., Hamilton.
Gas & Electric Power Co., Toronto.
T. & H. Electric Co., Hamilton.

Converters, Steel.
Northern Engineering Works, Detroit.

Conveyor Machinery.
Goldie & McCulloch Co., Galt
Jeffrey Mfg. Co., Columbus, Ohio.
Laurie Engine & Machine Co., Montreal.
Rice Lewis & Son, Toronto
John McDougall Caledonian Iron Works Co., Montreal.
Smart-Turner Machine Co., Hamilton.
Waterous Engine Works Co., Brantford.
Williams & Wilson, Montreal.
Wilson, J. C., & Co., Glenora, Ont

Conveyors, Chain.
Jeffrey Mfg. Co., Columbus, Ohio

Coping Machines.
John Bertram & Sons Co., Dundas, Ont.
London Mach. Tool Co., Hamilton
Niles-Bement-Pond Co., New York.

Core Compounds.
Buffalo Foundry Supply Co., Buffalo.
Detroit Foundry Supply Co., Windsor.
Dominion Foundry Supply Co., Toronto
Hamilton Facing Mill Co., Hamilton.
Smith, J. D., Foundry Supply Co., Cleveland, Ohio.

Core Machines.
Smith, J. D., Foundry Supply Co., Cleveland, Ohio

Core Ovens.
Detroit Foundry Supply Co., Windsor.
Dominion Foundry Supply Co., Montreal
Hamilton Facing Mill Co., Hamilton.
Sheldons Limited, Galt

Core Oven Bricks.
Detroit Foundry Supply Co., Windsor.
Dominion Foundry Supply Co., Montreal
Hamilton Facing Mill Co., Hamilton
Smith, J. D., Foundry Supply Co., Cleveland, Ohio

Core Sand Cleaners.
Sly, W. W., Mfg. Co., Cleveland

Core Wash.
Detroit Foundry Supply Co., Windsor.
Dominion Foundry Supply Co., Montreal
Hamilton Facing Mill Co., Hamilton.

Counterbores.
Cleveland Twist Drill Co., Cleveland

Couplings.
Owen Sound Iron Works Co., Owen Sound
Wilson, J. C., & Co. Glenora Ont

Couplings, Air.
Canadian Rand Co., Montreal
Independent Pneumatic Tool Co., Chicago

Cranes, Electric and Hand Power.
Canada Foundry Co., Limited Toronto
Canadian Pilling Co., Montreal
Canadian Rand Co., Montreal.
Dominion Foundry Supply Co., Montreal
Gas & Electric Power Co., Toronto
Gilmour, J., New York
Hamilton Facing Mill Co., Hamilton
John McDougall, Caledonian Iron Works Co., Montreal.
Niles-Bement-Pond Co., New York.
Northern Engineering Works Detroit
Owen Sound Iron Works Co., Owen Sound
Smart-Turner-Machine Co., Hamilton.
Smith, J. D., Foundry Supply Co., Cleveland, Ohio.

Crank Pin.
Sight Feed Oil Pump Co., Milwaukee, Wis.

Crankshafts.
St. Clair Bros., Galt

Crank Pin Turning Machine
London Mach. Tool Co., Hamilton.
Niles-Bement-Pond Co., New York.

Cross Head Pin.
Sight Feed Oil Pump Co., Milwaukee, Wis.

Crucibles.
Detroit Foundry Supply Co., Windsor
Dominion Foundry Supply Co., Montreal
Hamilton Facing Mill Co., Hamilton.
Seidel, R. B., Inc. Philadelphia
Smith, J. D., Foundry Supply Co., Cleveland, Ohio.

Crucible Caps
Dominion Foundry Supply Co Montreal
Hamilton Facing Mill Co., Hamilton.

Crushers, Rock or Ore.
Allis-Chalmers-Bullock, Montreal.
Jeffrey Mfg. Co., Columbus, Ohio.

Cupolas.
Detroit Foundry Supply Co., Windsor
Dominion Foundry Supply Co., Montreal
De Clercy, J., Montreal
Gilmour, J. New York.
Hamilton Facing Mill Co., Hamilton.
Northern Engineering Works, Detroit
Sheldons Limited, Galt.
Smith, J. D., Foundry Supply Co., Cleveland, Ohio.

Cupola Blast Gauges.
Dominion Foundry Supply Co., Montreal
Sheldons Limited, Galt

Cupola Blocks.
Detroit Foundry Supply Co., Detroit.
Dominion Foundry Supply Co., Toronto
Hamilton Facing Mill Co., Hamilton
Gilmour, J. New York.
Northern Engineering Works Detroit
Ontario Lime Association- Toronto

Cupola Blowers.
Canada Machinery Agency, Montreal.
Detroit Foundry Supply Co., Windsor
Dominion Foundry Supply Co., Toronto
Dominion Heating and Ventilating Co., Hespeler
Hamilton Facing Mill Co., Hamilton.
Northern Engineering Works, Detroit
Sheldon's Limited, Galt.

Cupola Linings.
Maurer, Henry, & Son, New York.

Cutters, Flue
Independent Pneumatic Tool Co., Chicago Ill.

Cutters, Gear.
Gould & Eberhardt, Newark, N J.

Cutter Grinder Attachment.
Cincinnati Milling Machine Co., Cincinnati

Cutter Grinders, Plain.
Cincinnati Milling Machine Co., Cincinnati

Cutter Grinders, Universal.
Cincinnati Milling Machine Co., Cincinnati

Cutters, Milling.
Becker, Brainard Milling Machine Co. Hyde Park, Mass.
Cleveland Twist Drill Co., Cleveland
Frothingham & Workman Ltd., Montreal
Hamilton Tool Co., Hamilton, Ont.
Owen Machine Tool Co., Springfield, Mass.
Pratt & Whitney Co., Hartford, Conn.
Standard Tool Co., Cleveland.

Cutting-off Machines.
Armstrong Bros., Tool Co., Chicago
John Bertram & Sons Co., Dundas, Ont.
Canada Machinery Agency, Montreal.
Rice Lewis & Son, Toronto.
London Mach. Tool Co., Hamilton.
H. W. Petrie, Toronto.
Pratt & Whitney Co., Hartford, Conn.

Cutting-off Tools.
Armstrong Bros. Tool Co., Chicago.
London Mach. Tool Co., Hamilton.
H. W. Petrie, Toronto.
Pratt & Whitney, Hartford, Conn.
Rice Lewis & Son, Toronto.
L. S. Starrett Co., Athol, Mass.

Damper Regulators.
Darling Bros., Ltd., Montreal

Dash Weights.
Richelieu Foundry Co., Sorel, Que.

Dies
Acme Stamping & Tool Co., Hamilton.
Armstrong Bros., Toronto
Bliss, E. W., Co., Brooklyn, N.Y.
Brown, Boggs Co., Hamilton
Ferracute Machine Co., Bridgeton, N.J.
Cleal, Joseph P., Toronto
Globe Machine & Stamping Co., Cleveland, Ohio.
Hall J. H., & Sons, Brantford
Hall, Jas. B., Toronto

Die Making Machinery.
Stevens Co., Galt, Ont.

Die Stocks
Canadian Tap & Die Co., Galt
Curtis & Curtis Co., Bridgeport, Conn.
Hart Manufacturing Co., Cleveland, Ohio
Jardine, A. B., & Co., Hespeler, Ont.

Dies, Opening
W. H. Banfield & Sons, Toronto
Globe Machine & Stamping Co., Cleveland Ohio.
Jardine, A. B. & Co., Hespeler, Ont.
Pratt & Whitney Co., Hartford, Conn.

Dies, Sheet Metal.
W. H. Banfield & Sons Toronto.
Bliss, E.W., Brooklyn, N.Y.
Consolidated Press & Tool Co. Hastings, Mich.
Ferracute Machine Co., Bridgeton N.J.
Globe Machine & Stamping Co., Cleveland Ohio
Stevens Co., Galt, Ont.

Dies, Threading,
Canadian Tap & Die Co., Galt
Frothingham & Workman, Ltd., Montreal
Hart Mfg. Co., Cleveland
Jardine, A. B., & Co., Hespeler, Ont.
John Millen & Son, Ltd., Montreal.

Draft, Mechanical.
W. H. Banfield & Sons, Toronto.
Butterfield & Co., Rock Island, Que.
A. B. Jardine & Co., Hespeler
Pratt & Whitney Co., Hartford, Conn.
Sheldons Limited, Galt.

Drawing Instruments.
Rice Lewis & Son, Toronto.

Drawn Steel, Cold.
Union Drawn Steel Co., Hamilton.

Drill Holders.
Armstrong Bros Tool Co., Chicago

Drilling Machines, Arch Bar.
John Bertram & Sons Co., Dundas, Ont.
London Mach. Tool Co., Hamilton
Niles-Bement-Pond Co., New York.

Drilling Machines, Boiler.
American Tool Works Co., Cincinnati.
John Bertram & Sons Co., Dundas, Ont.
Bickford Drill and Tool Co., Cincinnati.
The Canadian Fairbanks Co., Montreal.
A. B. Jardine & Co., Hespeler, Ont.
London Mach. Tool Co., Hamilton, Ont.
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.
Williams & Wilson, Montreal

Drilling Machines Connecting Rod.
John Bertram & Sons Co., Dundas, Ont.
London Mach. Tool Co., Hamilton.
Niles-Bement-Pond Co. New York.

Drilling Machines, Locomotive Frame.
American Tool Works Co., Cincinnati.
John Bertram & Sons Co., Dundas, Ont.
Rice Lewis & Son., Toronto.
London Mach. Tool Co., Hamilton, Ont.
Niles-Bement-Pond Co., New York.

Drilling Machines, Multiple Spindle.
American Tool Works Co., Cincinnati.
John Bertram & Sons Co., Dundas, Ont.
Bickford Drill & Tool Co., Cincinnati.
Canada Machinery Agency Montreal.
Rice Lewis & Son, Toronto.
London Mach. Tool Co., Hamilton, Ont
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.
Rice Lewis & Son, Toronto
Williams & Wilson, Montreal.

Drilling Machines, Pneumatic
Canada Machinery Agency, Montreal.
Canadian Rand Co., Montreal.
Independent Pneumatic Tool Co., Chicago, Ill.
Rice Lewis & Son, Toronto.

Drilling Machines, Portable
A. B. Jardine & Co., Hespeler, Ont.
Rice Lewis & Son, Toronto
Niles-Bement-Pond Co., New York.
W. H. Petrie, Toronto. New
Williams & Wilson Montreal

Drilling Machines, Radial.
American Tool Works Co., Cincinnati.
John Bertram & Sons Co., Dundas, Ont.
Bickford Tool & Drill Co., Cincinnati.
The Canadian Fairbanks Co., Montreal
Rice Lewis & Son, Toronto
London Mach. Tool Co., Hamilton.
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.
Williams & Wilson, Montreal.

Drilling Machines, Suspension.
John Bertram & Sons Co., Dundas, Ont.
Canada Machinery Agency Montreal.
London Mach. Tool Co., Hamilton.
Niles-Bement-Pond Co. New York

Drilling Machines, Turret.
John Bertram & Sons Co., Dundas, Ont.
London Mach. Tool Co., Hamilton.
Niles-Bement-Pond Co., New York.

Drilling Machines, Upright.
American Tool Works Co., Cincinnati.
John Bertram & Sons Co., Dundas, Ont
Dwight Slate Machine Co., Hartford
Hamilton Tool Co., Hamilton, Ont.

A. B. Jardine & Co., Hespeler, Ont.
Rice Lewis & Son, Toronto.
London Mach. Tool Co., Hamilton.

Drills, Bench.

Hamilton Tool Co, Hamilton, Ont.
Lewis, Rice & Son, Toronto.
London Mach. Tool Co., Hamilton.
Pratt & Whitney Co., Hartford, Conn.

Drills, Blacksmith.

Canada Mach'nery Agency, Montreal.
Frothingham & Workman, Ltd., Montreal
A. B. Jardine & Co., Hespeler, Ont.
London Mach. Tool Co., Hamilton.
Standard Tool Co., Cleveland.

Drills, Centre.

Cleveland Twist Drill Co., Cleveland
Lewis, Rice & Son, Toronto.
Pratt & Whitney Co., Hartford, Conn.
Standard Tool Co., Cleveland, O.
L. S. Starrett Co., Athol, Mass.

Drills, Coal and Plaster.

Cumming, J. W., New Glasgow, N.S.

Drills, Electric

Canadian Pilling Co., Montreal
Gas & Electric Power Co., Toronto.
Niles-Bement-Pond Co., New York.

Drills, Gang.

American Tool Works Co., Cincinnati.
John Bertram & Sons Co., Dundas, Ont.
Lewis, Rice & Son, Toronto.
Pratt & Whitney Co.. Hartford, Conn.

Drills, High Speed.

Cleveland Twist Drill Co, Cleveland
Frothingham & Workman, Ltd, Montreal
Alexander Gibb Montreal.
Lewis, Rice & Son, Toronto.
Pratt & Whitney Co., Hartford, Conn.
Standard Tool Co., Cleveland, O.

Drills, Hand.

A. B. Jardine & Co., Hespeler, Ont.

Drills, Horizontal.

John Bertram & Sons Co., Dundas, Ont.
Canada Machinery Agency, Montreal.
Lewis, Rice & Son, Toronto.
London Mach. Tool Co., Hamilton.
Niles-Bement-Pond Co., New York.

Drills, Pneumatic.

Allen, John F., New York
Canada Machinery Agency, Montreal.
Independent Pneumatic Tool Co., Chicago, New York
Niles-Bement-Pond Co., New York.

Drills, Radial.

American Tool Works Co., Cincinnati.
John Bertram & Sons Co., Dundas, Ont.
Bickford Drill & Tool Co.. Cincinnati
Lewis, Rice & Son, Toronto.
London Mach. Tool Co., Hamilton, Ont.
Niles-Bement-Pond Co., New York.

Drills, Ratchet.

Armstrong Bros. Tool Co, Chicago.
Cleveland Twist Drill Co., Cleveland
Frothingham & Workman, Ltd., Montreal
A. B. Jardine & Co., Hespeler,
Pratt & Whitney Co., Hartford, Conn.
Standard Tool Co., Cleveland.

Drills, Rock.

Allis-Chalmers-Bullock, Montreal.
Canadian Rand Drill Co., Montreal.
Jeffrey Mfg. Co., Columbus, Ohio.

Drills, Sensitive.

American Tool Works Co., Cincinnati.
Canada Machinery Agency, Montreal.
Dwight Slate Machine Co., Hartford.
Lewis, Rice & Son, Toronto.
McKenzie, D., Guelph, Ont.
Niles-Bement-Pond Co., New York

Drills, Twist.

Cleveland Twist Drill Co., Cleveland
Frothingham & Workman, Ltd., Montreal
Alex. Gibb, Montreal.
John Millen & Son, Ltd., Montreal.
Morse Twist Drill and Machine Co., New Bedford, Mass.
Pratt & Whitney Co., Hartford, Conn.
Standard Tool Co., Cleveland.
Whitman & Barnes Mfg. Co., St. Catharines, Ont.

Drying Apparatus of all Kinds.

Dominion Heating & Ventilating Co., Hespeler
Sheldons Limited, Galt

Dry Kiln Equipment.

Sheldons Limited, Galt

Dry Sand and Loam Facing.

Dominion Foundry Supply Co., Montreal
Hamilton Facing Mill Co., Hamilton.

Dump Cars.

Canada Foundry Co.. Limited, Toronto
Dominion Foundry Supply Co., Montreal
Hamilton Facing Mill Co., Hamilton.
Jeffrey Mfg. Co., Columbus, Ohio
John McDougall, Caledonian Iron Works Co., Montreal.
Niles-Bement-Pond Co., New York.

Owen Sound Iron Works Co., Owen Sound
Standard Bearings, Ltd.. Niagara Falls,
Waterous Engine Co., Brantford.

Duplicate Machinery.

Hall, J. H., & Sons, Brantford
Scott Machine Co., London.

Dust Arresters.

Sly, W. W., Mfg. Co., Cleveland

Dust Separators.

Dominion Heating and Ventilating Co., Hespler.
Sheldon's Limited, Galt.

Dynamos.

Allis-Chalmers-Bullock, Montreal.
Canadian General Electric Co.. Toronto.
Canadian Westinghouse Co., Hamilton.
Electrical Machinery Co., Toronto.
Gas & Electric Power Co., Toronto
Hall Engineering Works, Montreal, Que.
Lewis, Rice & Son, Toronto.
John Millen & Son, Ltd., Montreal.
Packard Electric Co., St. Catharines.
H. W. Petrie, Toronto.
T. & H. Electric Co., Hamilton.

Dynamos—Turbine Driven.

Gas & Electric Power Co. Toronto.
Kerr-Turbine Co., Wellsville, N.Y.

Economizer, Fuel.

Dominion Heating & Ventilating Co., Hespeler

Electrical Instruments.

Canadian Westinghouse Co.. Hamilton.
Gas & Electric Power Co, Toronto.

Electrical Pyrometers.

Thwing, C. B., Philadelphia

Electrical Supplies.

Canadian General Electric Co., Toronto.
Canadian Westinghouse Co., Hamilton.
Gas & Electric Power Co, Toronto
London Mach. Tool Co., Hamilton, Ont.
Packard Electric Co., St. Catharines.
T. & H. Electric Co., Hamilton.

Electrical Repairs

Canadian Westinghouse Co., Hamilton.
T. & H. Electric Co., Hamilton.

Elevators.

Jeffrey Mfg Co., Columbus, Ohio

Elevator Buckets.

Jeffrey Mfg. Co., Columbus, Ohio.

Emery and Emery Wheels.

Dominion Foundry Supply Co., Montreal
Frothingham & Workman Ltd, Montreal
Hamilton Facing Mill Co., Hamilton.

Emery Stands.

McKenzie, D., Guelph, Ont.

Emery Wheel Dressers.

Canada Machinery Agency, Montreal.
Dominion Foundry Supply Co., Montreal
Frothingham & Workman Ltd., Montreal
Hamilton Facing Mill Co., Hamilton.
John Millen & Son, Ltd., Montreal.
H. W. Petrie, Toronto.
Standard Tool Co., Cleveland.

Engineers and Contractors.

Canada Foundry Co, Limited, Toronto.
Darling Bros., Ltd., Montreal
Gas & Electric Power Co., Toronto.
Goldie & McCulloch Co., Galt, Ont.
Hall Engineering Works, Montreal,
Laurie Engine & Machine Co., Montreal.
John McDougall, Caledonian Iron Works Co., Montreal.
Robb Engineering Co., Amherst, N.S.
The Smart-Turner Mach. Co., Hamilton.

Engineers' Supplies.

Frothingham & Workman, Ltd.. Montreal
Hall Engineering Works, Montreal.
Rice Lewis & Son, Toronto.

Engines, Gas and Gasoline.

Canada Foundry Co., Toronto.
Canada Machinery Agency, Montreal.
The Canadian Fairbanks Co., Montreal.
Gas & Electric Power Co., Toronto
Gilson Mfg. Co., Guelph
The Goldie & McCulloch Co., Galt, Ont.
Jones & Glassco, Montreal
Rice Lewis & Son, Toronto.
H. W. Petrie, Toronto.
The Smart-Turner Mach. Co., Hamilton

Engines, Oil.

Dinning & Eckinstein, Montreal.
Jones & Glassco, Montreal

Engines, Steam.

Allis-Chalmers-Bullock, Montreal
Belliss & Marcom, Birmingham, Eng.
Canada Machinery Agency, Montreal.
The Goldie & McCulloch Co., Galt, Ont.
Rice Lewis & Son, Toronto.
Laurie Engine & Machine Co., Montreal.
Gas & Electric Power Co., Toronto.
John McDougall Caledonian Iron Works. Montreal.
Robb Engineering Co., Amherst, N.S.
Sheldons Limited, Galt.

The Smart-Turner Mach. Co., Hamilton.
Waterous Engine Works Co., Brantford.

Excavating Machinery.

Jeffrey Mfg Co., Columbus, Ohio

Exhaust Heads.

Darling Bros, Ltd., Montreal.
Dominion Heating & Ventilating Co., Hespeler
Sheldons Limited, Galt, Ont.

Expanded Metal.

Expanded Metal and Fireproofing Co. Toronto

Expanders.

A. B. Jardine & Co., Hespeler, Ont.

Fans, Electric.

Canadian General Electric Co., Toronto
Canadian Westinghouse Co., Hamilton.
Dominion Heating & Ventlating Co. Hespeler
Gas & Electric Power Co, Toronto.
Sheldons Limited Galt, Ont.
The Smart-Turner Mach. Co., Hamilton.

Fans, Exhaust.

Detroit Foundry Supply Co., Windsor.
Dominion Foundry Supply Co., Toronto
Dominion Heating & Ventilating Co., Hespeler.
Gas & Electric Power Co. Toronto.
Hamilton Facing Mill Co., Hamilton.
Sheldons Limited, Galt.

Feed Water Heaters.

Darling Bros., Montreal
Laurie Engine & Machine Co., Montreal
John McDougall, Caledonian Iron Works Co., Montreal.
The Smart-Turner Mach. Co., Hamilton

Fillet, Pattern.

Detroit Foundry Supply Co., Windsor.
Dominion Foundry Supply Co, Toronto
Hamilton Facing Mill Co, Hamilton.

Fire Apparatus.

Waterous Engine Works Co., Brantford.

Fire Brick and Clay.

Detroit Foundry Supply Co., Windsor.
Dominion Foundry Supp'y Co., Toronto
Gilmour, J., New York.
Harbison - Walker Refractories Co., Pittsburg
Mauer, Henry, & Son, New York
Hamilton Facing Mill Co., Hamilton
Ontario Lime Association Toronto

Fireproofing Hollowtile.

Maurer, Henry, & Son, New York

Forges.

Canada Foundry Co., Limited, Toronto.
Frothingham & Workman Ltd., Montreal
Hamilton Facing Mill Co., Hamilton.
Independent Pneumatic Tool Co., Chicago, Ill.
H. W. Petrie, Toronto.
Sheldons Limited, Galt, Ont.

Forgings, Drop.

Bliss, E. W., Co., Brooklyn, N.Y.
John McDougall, Caledonian Iron Works Co. Montreal.
H. W. Petrie, Toronto.
St. Clair Bros, Galt
Wilson J. C., & Co, Glenora, Ont.

Forgings, Light & Heavy.

Hamilton Steel & Iron Co., Hamilton
Manitoba Iron Works, Winnipeg

Forging Machinery.

John Bertram & Sons Co, Dundas, Ont.
Bliss, E. W., Co, Brooklyn, N.Y.
London Mach. Tool Co., Hamilton, Ont
National Machinery Co., Tiffin. Ohio
Niles-Bement-Pond Co., New York.

Founders.

John McDougall, Caledonian Iron Works Co., Montreal
Niagara Falls Machinery & Foundry Co., Niagara Falls, Ont.
Richelieu Foundry Co, Sorel, Que.
The Smart-Turner Mach. Co., Hamilton.
Wilson, J. C., & Co., Glenora, Ont.

Foundry Coke.

Baird & West, Detroit

Foundry Equipment.

Detroit Foundry Supply Co., Windsor.
Dominion Foundry Supply Co., Toronto
Gilmour, J, New York.
Hamilton Facing Mill Co., Hamilton
Northern Engineering Works, Detroit

Foundry Parting.

Doggett, Stanley, New York
Dominion Foundry Supply Co., Toronto
Partamol Co, New York
Stanley Doggett, New York

Foundry Facings.

Detroit Foundry Supply Co., Windsor.
Doggett, Stanley, New York

Dominion Foundry Supply Co., Toronto
Hamilton Facing Mill Co., Hamilton.
Smith, J. D., Foundry Supply Co., Cleveland, Ohio.

Friction Clutch Pulleys, etc.

The Goldie & McCulloch Co., Galt.

Furnaces.

Detroit Foundry Supply Co., Windsor.
Dominion Foundry Supply Co. Montreal
Hamilton Facing Mill Co., Hamilton.
Northern Engineering Works, Detroit
Smith, J D., Foundry Supply Co., Cleveland, Ohio.

Gang Planer Tools.

Armstrong Bros. Tool Co., Chicago

Gas Blowers and Exhausters.

Dominion Heating & Ventilating Co Hespeler
Sheldons Limited, Galt.

Gas Furnaces.

Chicago Flexible Shaft Co., Chicago

Gas Produce Plants.

Canada Foundry Co., Toronto
Gas & Electric Power Co, Toronto
Jones & Glassco, Montreal
Williams & Wilson, Montreal

Gauges, Standard.

Cleveland Twist Drill Co. Cleveland
Pratt & Whitney Co., Hartford, Conn.

Gear Cutting Machinery.

Armstrong Bros., Toronto
Becker - Brainard Milling Mach. Co. Hyde Park, Mass.
Bickford Drill & Tool Co., Cincinnati.
Dwight Slate Machine Co., Hartford
Fellows Gear Shaper Co., Springfield, Vt.
Gould & Eberhardt, Newark, N.J.
Lewis, Rice & Son, Toronto.
London Mach. Tool Co., Hamilton.
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.
Pratt & Whitney Co., Hartford. Conn.
Stevens Co., Galt, Ont.
Williams & Wilson, Montreal.
Wilson, J. C., & Co, Glenora, Ont.

Gear Hobbing Machines.

Gould & Eberhardt, Newark, N.J.

Gears, Angle.

Boston GearWorks Norfolk Downs, Mass.
Goldie & McCulloch Co., Galt, Ont.
Gould & Eberhardt, Newark. N.J.
Laurie Engine & Machine Co., Montreal.
John McDougall, Caledonian Iron Works Co., Montreal.
Waterous Engine Co., Brantford.
Wilson, J. C., & Co., Glenora, Ont.

Gears, Cut.

Goldie & McCulloch Co., Galt, Ont
Gould & Eberhardt, Newark, N.J.
Horsburgh & Scott Co., Cleveland
Wilson, J. C., & Co. Glenora, Ont.
Boston Gear Works, Norfolk Downs, Mass

Gears, Iron.

Boston GearWorks. Norfolk Downs, Mass
Goldie & McCulloch Co., Galt, Ont.
Gould & Eberhardt, Newark N.J.
Wilson, J. C., & Co., Glenora, Ont.

Gears, Mortise.

Boston Gear Works, Norfolk Downs, Mass.
Goldie & McCulloch Co, Galt, Ont.
Wilson, J. C., & Co., Glenora, Ont.

Gears, Rawhide.

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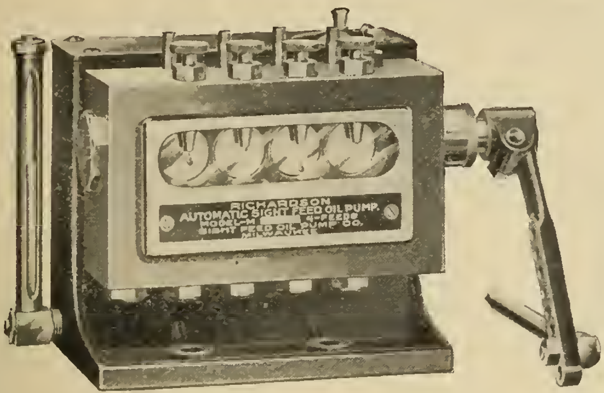

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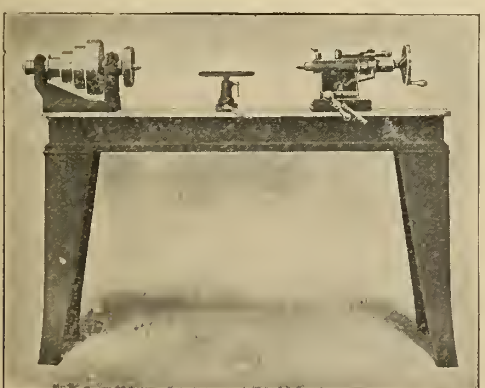

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Pumping Machinery.
Canada Foundry Co., Limited, Toronto
Canada Machinery Agency, Montreal.
Canadian Rand Co., Montreal.
Darling Bros., Ltd., Montreal
Gas & Electric Power Co., Toronto.
Goldie & McCulloch Co., Galt, Ont.
Hall Engineering Works, Montreal, Que.
Laurie Engine & Machine Co., Montreal.
London Mach. Tool Co., Hamilton, Ont.
John McDougall Caledonian Iron Works Co., Montreal.
The Smart-Turner Mach. Co., Hamilton

Punches and Dies.
W. H. Banfield & Sons, Toronto.
Bliss, E. W., Co, Brooklyn, N.Y.
Butterfield & Co., Rock Island.
Ferracute Machine Co., Bridgeton, N.J.
Globe Machine & Stamping Co.
A. B. Jardine & Co., Hespeler, Ont.
London Mach Tool Co., Hamilton, Ont.
Pratt & Whitney Co., Hartford, Conn.
H. W. Petrie, Toronto.

Punches, Power.
John Bertram & Sons Co., Dundas, Ont.
E. W. Bliss Co., Brooklyn, N.Y.
Canada Machinery Agency, Montreal.
Consolidated Press & Tool Co., Hastings, Mich.
Ferracute Machine Co., Bridgeton, N J.
Lewis, Rice & Son, Toronto.
London Mach. Tool Co., Hamilton, Ont.
Niles-Bement-Pond Co., New York.

Punches, Pneumatic.
Allen, John F., New York

Punches, Turret.
London Mach. Tool Co., London, Ont.

Punching Machines, Horizontal.
John Bertram & Sons Co, Dundas, Ont.
London Mach. Tool Co., Hamilton. Ont.
Niles-Bement-Pond Co., New York.

Quartering Machines.
John Bertram & Sons Co., Dundas, Ont.
London Mach. Tool Co., Hamilton, Ont.

Rack Cutting Machines.
Gould & Eberhardt, Newark, N.J.

Railway Spikes and Washers.
Hamilton Steel & Iron Co., Hamilton

Rammers, Bench and Floor.
Detroit Foundry Supply Co., Windsor
Dominion Foundry Supply Co., Toronto

Hamilton Facing Mill Co., Hamilton.
Smith, J. D, Foundry Supply Co, Cleveland, Ohio.

Rapping Plates.
Detroit Foundry Supply Co., Windsor
Dominion Foundry Supply Co, Toronto
Hamilton Facing Mill Co., Hamilton.

Raw Hide Pinions.
Horsburgh & Scott Co., Cleveland

Reamers.
Butterfield & Co., Rock Island.
Cleveland Twist Drill Co., Cleveland
Frothingham & Workman Ltd., Montreal
Hamilton Tool Co., Hamilton
A. B. Jardine & Co., Hespeler, Ont.
Morse Twist Drill and Machine Co., New Bedford, Mass
Pratt & Whitney Co., Hartford, Conn.
Standard Tool Co., Cleveland.
Whitman & Barnes Mfg. Co., St. Catharines, Ont.

Reamers, Adjustable.
Cleveland Twist Drill Co., Cleveland
Lapointe Machine Tool Co., Hudson, Mass.
Pratt & Whitney Co., Hartford, Conn.

Reamers, One-Lock Adjustable.
Smith, Wm. J., Co., New Haven, Conn.

Reamers, Pipe.
Canadian Tap & Die Co., Galt.
Whitman & Barnes Mfg. Co, St. Catharines, Ont.

Reamers, Steel Taper.
Butterfield & Co., Rock Island.
A. B. Jardine & Co., Hespeler, Ont.
John Millen & Son Ltd., Montreal.
Pratt & Whitney Co., Hartford, Conn.
Standard Tool Co., Cleveland.
Whitman & Barnes Mfg Co., St. Catharines, Ont.

Rheostats.
Canadian General Electric Co., Toronto.
Canadian Westinghouse Co., Hamilton.
Gas & Electric Power Co, Toronto.
Hall Engineering Works, Montreal, Que.
T. & H. Electric Co., Hamilton,

Riddles.
Detroit Foundry Supply Co., Windsor
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Allen, John F., New York

Riveting Machines, Hydraulic.
Allen, John F., New York

Riveting Machines, Pneumatic.
Allen, John F., New York

Riveters, Pneumatic.
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Independent Pneumatic Tool Co. Chicago, Ill.

Rolls, Bending.
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Niles-Bement-Pond Co., New York.

Rotary Converters.
Allis-Chalmers-Bullock, Ltd., Montreal.
Canadian Westinghouse Co., Hamilton
Toronto and Hamilton Electric Co., Hamilton.

Rubber Stamps.
Cairns, B., Toronto

Safes.
The Goldie & McCulloch Co., Galt,

Sand Blast Machinery.
Canadian Rand Co., Montreal.
Detroit Foundry Supply Co., Windsor
Dominion Foundry Supply Co., Montreal
Hamilton Facing Mill Co., Hamilton.

Sand, Heavy, Grey Iron.
Albany & No. River Molding Sand Co, Albany, N.Y.
Detroit Foundry Supply Co, Windsor
Dominion Foundry Supply Co., Montreal
Hamilton Facing Mill Co., Hamilton.

Sand, Malleable.
Albany & No River Molding Sand Co., Albany, N.Y.
Detroit Foundry Supply Co., Windsor
Dominion Foundry Supply Co, Montreal
Hamilton Facing Mill Co., Hamilton.

Sand, Medium Grey Iron.
Albany & No. River Molding Sand Co., Albany, N.Y.

Detroit Foundry Supply Co., Windsor
Dominion Foundry Supply Co., Toronto
Hamilton Facing Mill Co., Hamilton.

Sand Sifters.

Detroit Foundry Supply Co., Windsor
Dominion Foundry Supply Co., Montreal
Hamilton Facing Mill Co., Hamilton.

Saw Mill Machinery.

Allis-Chalmers-Bullock, Limited, Montreal
Canada Machinery Agency, Montreal.
Fay, J. A., & Egan Co., Cincinnati
Goldie & McCulloch Co. Galt.
Jeffrey Mfg. Co., Columbus, Ohio.
Owen Sound Iron Works Co., Owen Sound
H. W. Petrie, Toronto.
Robb Engineering Co. Amherst, Ont.
Waterous Engine Works, Brantford
Williams & Wilson Montreal.
Wilson, J. C., & Co., Glenora, Ont.

Sawing Machines, Metal.

Niles-Bement-Pond Co. New York.

Saws, Hack.

Canada Machinery Agency, Montreal.
Detroit Foundry Supply Co., Windsor
Frothingham & Workman, Ltd., Montreal
London Mach. Tool Co., Hamilton
Rice Lewis & Son, Toronto.
McKenzie, D., Guelph, Ont
Simonds Canada Saw Co. Montreal.
L. S. Starrett Co., Athol, Mass.

Screw Cutting Tools

Canadian Tap & Die Co., Galt.
Hart Manufacturing Co., Cleveland, Ohio
Jardine, A. B., & Co., Hespeler, Ont.

Screw Machines, Automatic.

Canada Machinery Agency, Montreal.
London Mach. Tool Co., Hamilton, Ont.
National-Acme Mfg. Co., Cleveland.
Pratt & Whitney Co., Hartford, Conn.

Screw Machines, Hand.

Canada Machinery Agency, Montreal.
A. B. Jardine & Co., Hespeler.
London Mach. Tool Co., Hamilton, Ont.
Pratt & Whitney Co., Hartford, Conn.
Warner & Swasey Co., Cleveland, O.

Screw Machines, Multiple Spindle.

National-Acme Mfg. Co., Cleveland

Screw Slotter Blades.

Simonds Canada Saw Co., Montreal.

Screw Plates.

Butterfield & Co., Rock Island, Que.
Canadian Tap & Die Co., Galt
Frothingham & Workman, Ltd., Montreal
Hart Manufacturing Co., Cleveland, Ohio
A. B. Jardine & Co., Hespeler

Screws, Cap and Set.

National-Acme Mfg. Co., Cleveland

Screw Slotting Machinery, Semi-Automatic.

National-Acme Mfg. Co., Cleveland

Shafting.

Canada Machinery Agency, Montreal
The Canadian Fairbanks Co., Montreal.
Fay, J. A., & Egan Co., Cincinnati
Frothingham & Workman, Ltd., Montreal
The Goldie & McCulloch Co., Galt, Ont
Kennedy, Wm., & Sons. Owen Sound
Niles-Bement-Pond Co., New York.
Owen Sound Iron Works Co., Owen Sound
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Smart-Turner Machine Co., Hamilton.
Union Drawn Steel Co., Hamilton.
Waterous Engine Co., Brantford.
Wilson, J. C., & Co., Glenora, Ont.

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American Tool Works Co., Cincinnati.
John Bertram & Sons Co., Dundas, Ont
Canada Machinery Agency, Montreal.
The Canadian Fairbanks Co., Montreal.
Cincinnati Shaper Co. Cincinnati, Ohio
Gould & Eberhardt Newark N.J.
Rice Lewis & Son, Toronto.
London Mach. Tool Co. Hamilton, Ont
McKenzie, D., Guelph, Ont.
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.
Pratt & Whitney Co., Hartford, Conn.
Steptoe, John, Shaper Co., Cincinnati
Stockbridge Machine Co., Worcester
Williams & Wilson, Montreal.

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Stockbridge Machine Co., Worcester, Mass.

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Carborundum Co., Niagara Falls, N.Y.

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Niles-Bement-Pond Co., New York.

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Niles-Bement-Pond Co., New York.

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Shears, Rotary.

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Consolidated Press & Tool Co., Hastings, Mich.

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Consolidated Press & Tool Co., Hastings, Mich.
Ferracute Machine Co., Bridgeton, N.J.

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Armstrong Bros. Tool Co., Chicago

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Soapstone.

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Doggett, Stanley, New York
Dominion Foundry Supply Co., Montreal
Hamilton Facing Mill Co., Hamilton.

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Doggett Stanley, New York
Smith, J. D., Foundry Supply Co., Cleveland, Ohio.

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Cleveland Wire Spring Co., Cleveland

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Smith, J. D., Foundry Supply Co., Cleveland, Ohio.

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Robb Engineering Co., Montreal.
Sheldon's Limited, Galt.
Smart-Turner Mach. Co., Hamilton
Waterous Engine Co., Brantford.

Steam Specialties.

Darling Bros., Ltd., Montreal
Dominion Heating & Ventilating Co., Hespeler
Sheldon's Limited, Galt.

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Canada Machinery Agency, Montreal.
Darling Bros., Ltd., Montreal
Dominion Heating & Ventilating Co., Hespeler.
Sheldons Limited, Galt.

Steam Valves.

Darling Bros., Ltd., Montreal

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Koppel, Arthur, Co., New York

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Sheldon's Limited, Galt.

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B. K. Morton Co., Sheffield, Eng.
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Pratt & Whitney Co., Hartford, Conn.

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Bliss, E. W., Co., Brooklyn, N.Y.
Canadian Rand Co., Montreal.

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Detroit Foundry Supply Co., Windsor.
Dominion Foundry Supply Co., Toronto
Hamilton Facing Mill Co., Hamilton.
Smith, J. D., Foundry Supply Co., Cleveland, Ohio.

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A. B. Jardine & Co., Hespeler, Ont.

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Canadian Westinghouse Co., Hamilton
Gas & Electric Power Co., Toronto.
Hall Engineering Works, Montreal, Que.
Toronto and Hamilton Electric Co., Hamilton.

Talc.

Detroit Foundry Supply Co., Windsor.
Doggett, Stanley, New York
Dominion Foundry Supply Co., Toronto
Hamilton Facing Mill Co., Hamilton.
Smith, J. D., Foundry Supply Co., Cleveland, Ohio.

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Sight Feed Oil Pump Co., Milwaukee, Wis.

Tanks, Steel.

Goldie & McCulloch Co., Galt, Ont.

Tap Wrenches.

Canadian Tap & Die Co., Galt.

Tapping Machines and Attachments.

American Tool Works Co., Cincinnati.
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Bickford Drill & Tool Co., Cincinnati.
Blair Tool & Machine Works, New York.
The Geometric Tool Co., New Haven,
A. B. Jardine & Co., Hespeler.
Lewis, Rice & Son, Toronto.
London Mach. Tool Co., Hamilton, Ont
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.
Pratt & Whitney, Cincinnati, O.
L. S. Starrett Co., Athol, Mass.
Williams & Wilson, Montreal.

Taps, Collapsing.

The Geometric Tool Co., New Haven

Taps, Adjustable.

Lapointe Machine Tool Co., Hudson, Mass.

Taps, Screw.

Whitman & Barnes Mfg. Co., St. Catharines, Ont.

Taps and Dies.

Wm. Abbott, Montreal.
Butterfield & Co., Rock Island, Que.
Canadian Tap & Die Co., Galt, Ont.
Cleveland Twist Drill Co., Cleveland
Frothingham & Workman, Ltd., Montreal
The Geometric Tool Co., New Haven.
A. B. Jardine & Co., Hespeler, Ont.
Rice Lewis & Son, Toronto.
John Millen & Son, Ltd., Montreal
Pratt & Whitney Co., Hartford, Conn.
Standard Tool Co., Cleveland.
L. S. Starrett Co., Athol, Mass.

Testing Machines.

Detroit Foundry Supply Co., Windsor.
Dominion Foundry Supply Co., Montreal
Hamilton Facing Mill Co., Hamilton.

Thread Cutting Tools.

Canadian Tap & Die Co., Galt.
Hall John H., & Son, Brantford, Ont.
Hart Manufacturing Co., Cleveland, Ohio

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Toronto Plate Glass Importing Co., Toronto.

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Bliss, E. W., Co., Brooklyn, N.Y.
Canada Machinery Agency, Montreal.
Ferracute Machine Co., Bridgeton, N.J

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Stevens Co., Galt, Ont.

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Canadian Rand Co., Montreal.

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Armstrong Bros. Tool Co., Chicago.
Cleveland Twist Drill Co., Cleveland
John Millen & Son, Ltd., Montreal.
H. W. Petrie, Toronto.
Pratt & Whitney Co., Hartford, Conn.

Tool Posts, Lathe.

Armstrong Bros. Tool Co. Chicago

Tool Steel.

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Flockton, Tompkin & Co., Sheffield, Eng
Frothingham & Workman Ltd., Montreal
Alexander Gibb, Montreal.
Wm. Jessop, Sons & Co., Toronto.
B. K. Morton & Co., Sheffield, Eng.
Williams & Wilson, Montreal.

Tools, Lathe, Planer and Slotter.

Armstrong Bros. Tool Co., Chicago

Torches, Steel.

Detroit Foundry Supply Co., Windsor.
Dominion Foundry Supply Co., Montreal
Hamilton Facing Mill Co., Hamilton.

Transformers and Convertors

Allis-Chalmers-Bullock, Montreal.
Canadian General Electric Co., Toronto.
Canadian Westinghouse Co., Hamilton.
Gas & Electric Power Co., Toronto.
Hall Engineering Works, Montreal, Que.
T. & H. Electric Co., Hamilton.

Transmission Machinery

Allis-Chalmers-Bullock, Montreal.
The Canadian Fairbanks Co., Montreal.
Gas & Electric Power Co., Toronto.
Goldie & McCulloch Co., Galt, Ont
Laurie Engine & Machine Co., Montreal.
Lewis, Rice & Son, Toronto.
H. W. Petrie, Toronto.
The Smart-Turner Mach. Co., Hamilton.
Waterous Engine Co., Brantford.
Wilson, J. C., & Co., Glenora, Ont.

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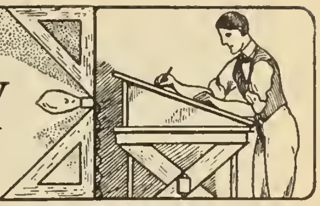

Transmission Supplies
The Canadian Fairbanks Co., Montreal.
The Goldie & McCulloch Co., Galt.
Manitoba Iron Works, Winnipeg.
H. W. Petrie, Toronto.

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Canadian Rand Co., Montreal.
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Canadian Westinghouse Co., Hamilton.
Gas & Electric Power Co., Toronto.
Kerr Turbine Co., Wellsville, N.Y.

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Dominion Foundry Supply Co., Toronto
Hamilton Facing Mill Co., Hamilton.
Northern Engineering Works, Detroit

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National Machinery Co., Tiffin, O.
Niles-Bement-Pond Co., New York.

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Golden-Anderson Valve Specialty Co., Pittsburg, Pa.

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Darling Bros., Ltd., Montreal
Dominion Heating & Ventilating Co., Hespeler
Sheldon's Limited, Galt.

Valve Reseating Machines.
Darling Bros. Ltd., Montreal

Ventilating Apparatus.
Canada Machinery Agency, Montreal
Darling Bros., Ltd., Montreal
Dominion Heating & Ventilating Co., Hespeler, Ont.
Sheldon's Ltd., Galt

Vises, Bench.
Hall, John H., & Son, Brantford, Ont.
Stevens Co., Galt, Ont.

Vises, Drill.
Stevens Co., Galt Ont.

Vises Milling Machines.
Stevens Co., Galt, Ont.

Vises, Planer and Shaper.
American Tool Works Co., Cincinnati, O.
Frothingham & Workman, Ltd., Montreal
Niles-Bement-Pond Co., New York.

Washer Machines.
National Machinery Co., Tiffin, Ohio.

Water Wheels.
Allis-Chalmers-Bullock Co., Montreal.
Canada Machinery Agency, Montreal.
John McDougall Caledonian Iron Works Co., Ltd., Montreal
Wilson, J. C., & Co., Glenora, Ont.

Water Wheels, Turbine.
Wilson, J. C., & Co, Glenora, Ont.

Wheelbarrows.
Buffalo Foundry Supply Co., Buffalo
Detroit Foundry Supply Co., Windsor.
Dominion Foundry Supply Co, Toronto
Frothingham & Workman, Ltd., Montreal
Hamilton Facing Mill Co., Hamilton.

Winches.
Canadian Pilling Co., Montreal
Frothingham & Workman, Ltd, Montreal

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B. Greening Wire Co., Hamilton, Ont

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Eugene F. Phillips Electrical Works, Montreal

Wire, Bare and Insulated.
Eugene F. Phillips Electrical Works, Montreal.

Wire Chains.
The B. Greening Wire Co., Hamilton.

Wire, Magnet and Trolley.
Eugene F. Phillips Electrical Works, Montreal.

Wire, Railway Feeder and Trolley.
Eugene F. Phillips Electrical Works, Montreal.

Wire Working Machinery.
Brand, Ed., Manchester, Eng

Wire Cloth and Perforated Metals.
Expanded Metal and Fireproofing Co Toronto.
B. Greening Wire Co., Hamilton, Ont.
Johnson C. H., & Sons, St. Henri, Montreal.

Wire Guards and Railings.
Expanded Metal and Fireproofing Co Toronto.
B. Greening Wire Co. Hamilton, Ont.

Wire Nail Machinery.
National Machinery Co., Tiffin, Ohio.

Wire Rope.
Bullivant & Co., London, Eng.
Frothingham & Workman Ltd. Montreal
B. Greening Wire Co., Hamilton, Ont.

Wood Boring Machines. Pneumatic.
Independent Pneumatic Tool Co., Chicago, Ill.

Wood-working Machinery.
Canada Machinery Agency, Montreal.
The Canadian Fairbanks Co., Montreal.
Fay, J. A., & Egan Co., Cincinnati
Goldie & McCulloch Co., Galt.
H. W. Petrie, Toronto.
Waterous Engine Works Co., Brantford
Williams & Wilson, Montreal.

Wrenches.
Whitman & Barnes Mfg. Co., St. Catharines, Ont.

ALPHABETICAL INDEX

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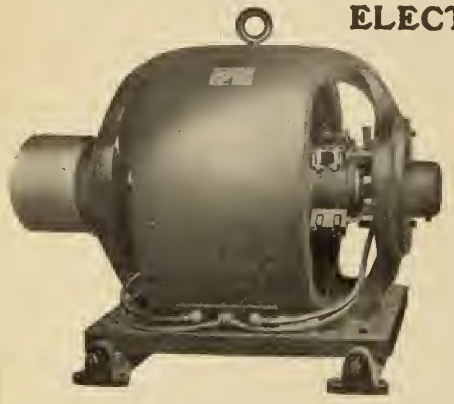

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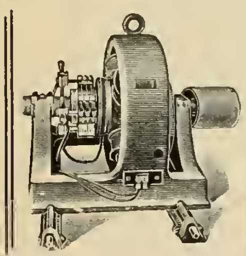

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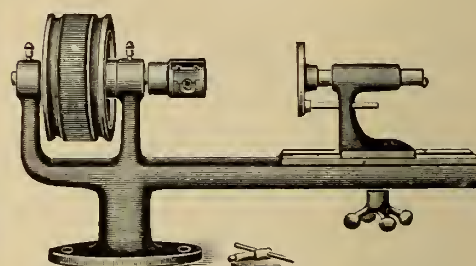

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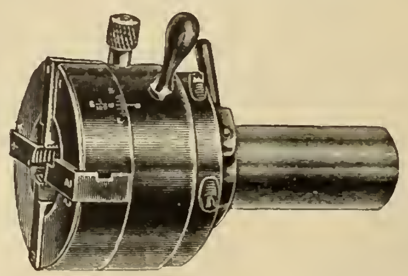

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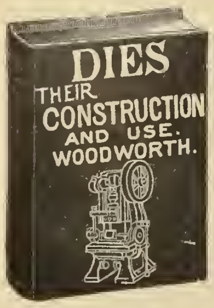
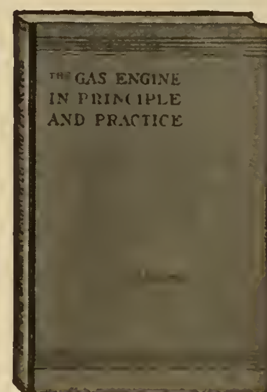


by J. V. Woodworth.
Price $3.00, Postpaid.
384 Pages, 505 Illustrations.

This practical and elaborate treatise on the design, construction and use of dies, punches, tools, giving the manner in which they should be used in the power press for the cheap and rapid production of sheet metal articles is of great interest and value to the manufacturer as well as to the tool maker. Special reference is made to the hardening and tempering of press tools, use of files, etc.

The Gas Engine in Principle and Practice



by A. H. Goldingham.
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195 Pages, 107 Illustrations

The articles in this book give clearly and concisely the comparison of the two-cycle and four-cycle types of Internal Combustion Engines, with description of the Various Designs, together with notes on Suction and Pressure Type Gas Producers, Crude Oil Vaporizers, etc. It is of great value to EVERYONE interested in GAS ENGINES.

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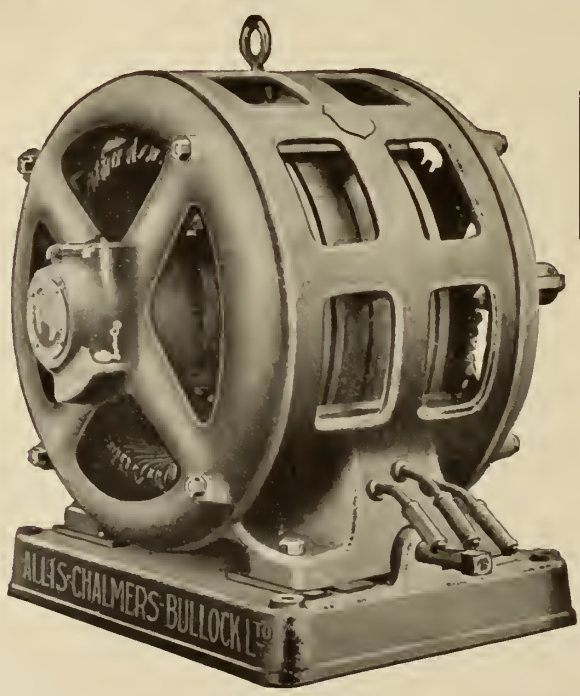

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Vol. IV. May, 1908 No. 5

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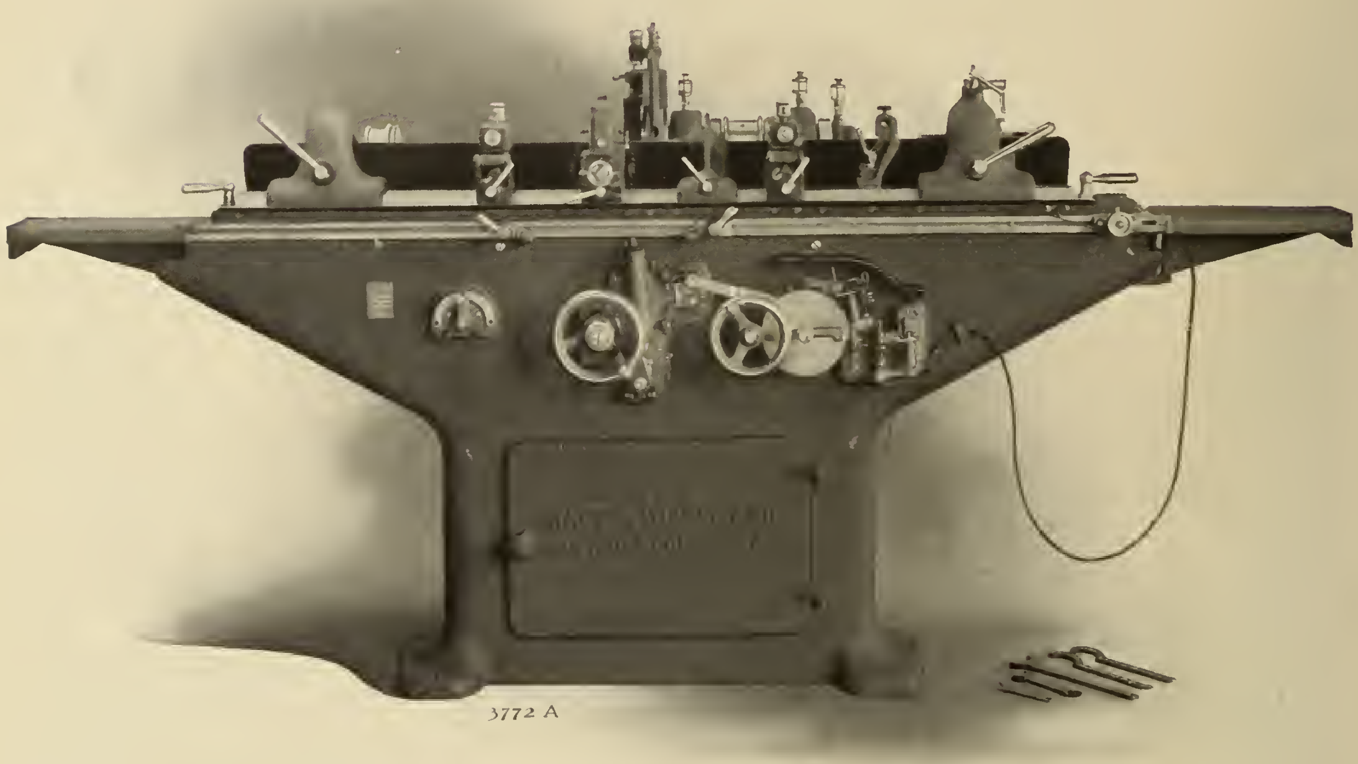

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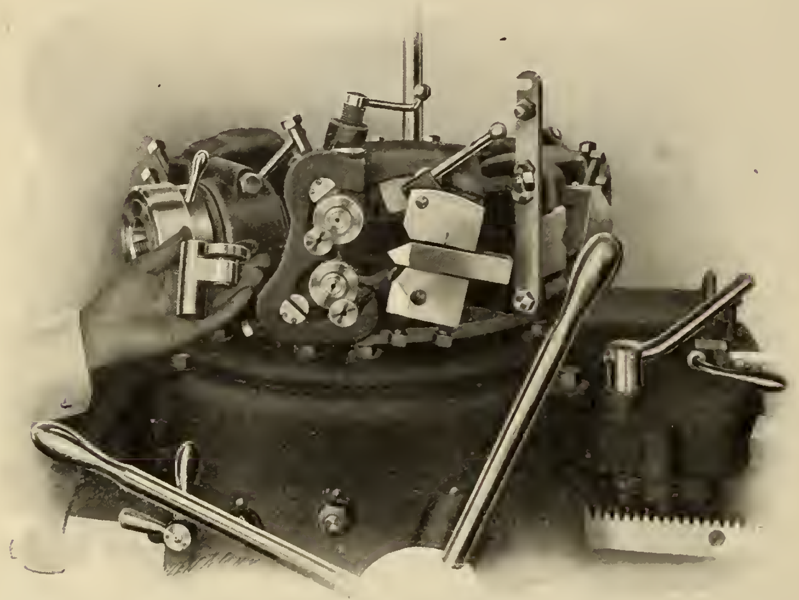

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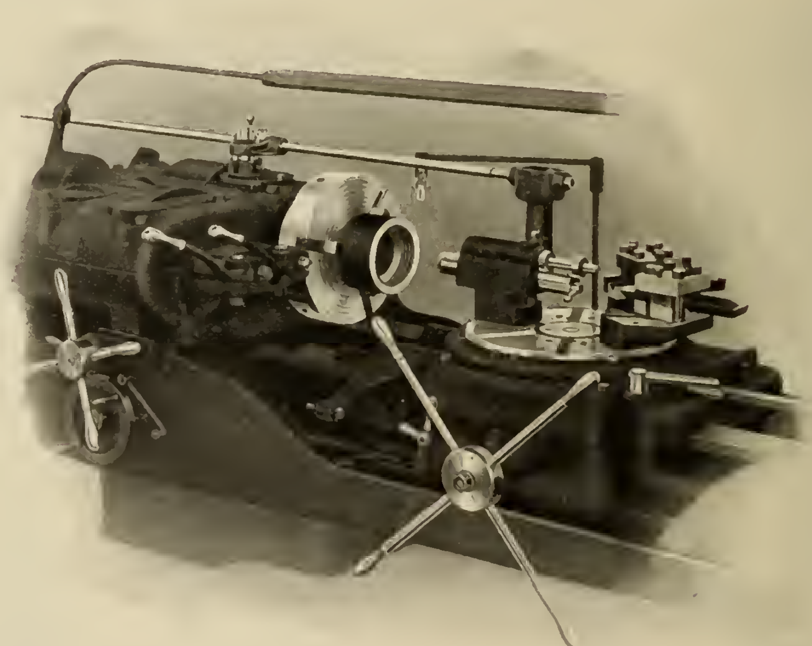

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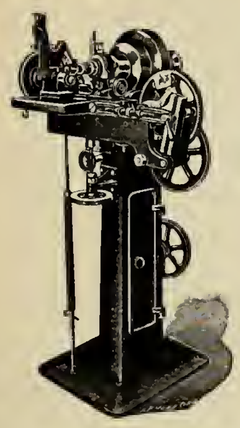

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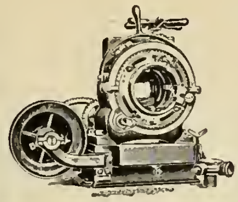

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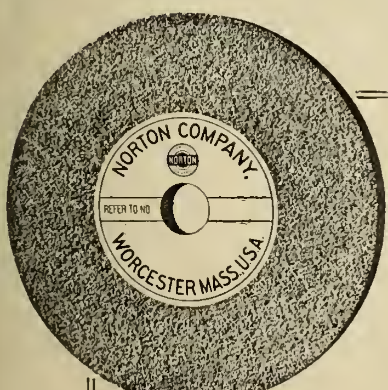

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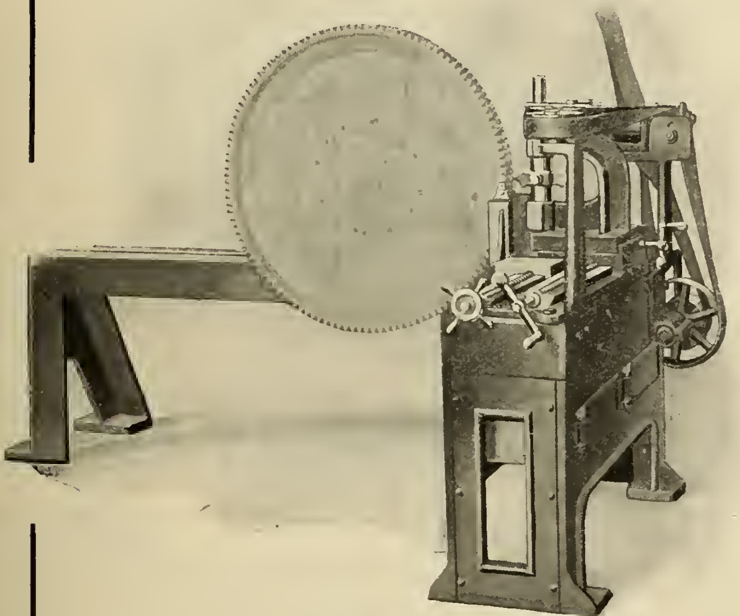

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Cut Gears taken from machine are ready for shellac without any Sand papering. Let your local pattern-maker figure on your gears and then deduct 75% and you have a liberal price of what gears will cost you cut on this machine. Gears made on this machine are absolutely perfect.

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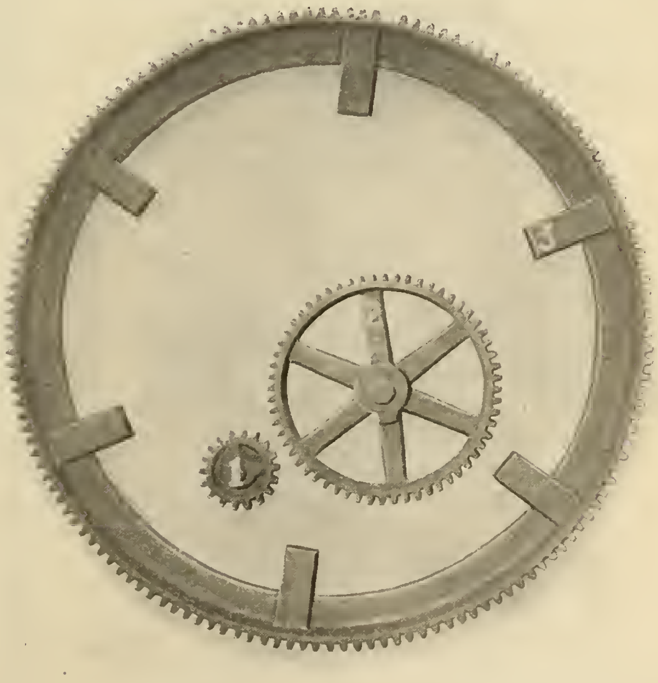

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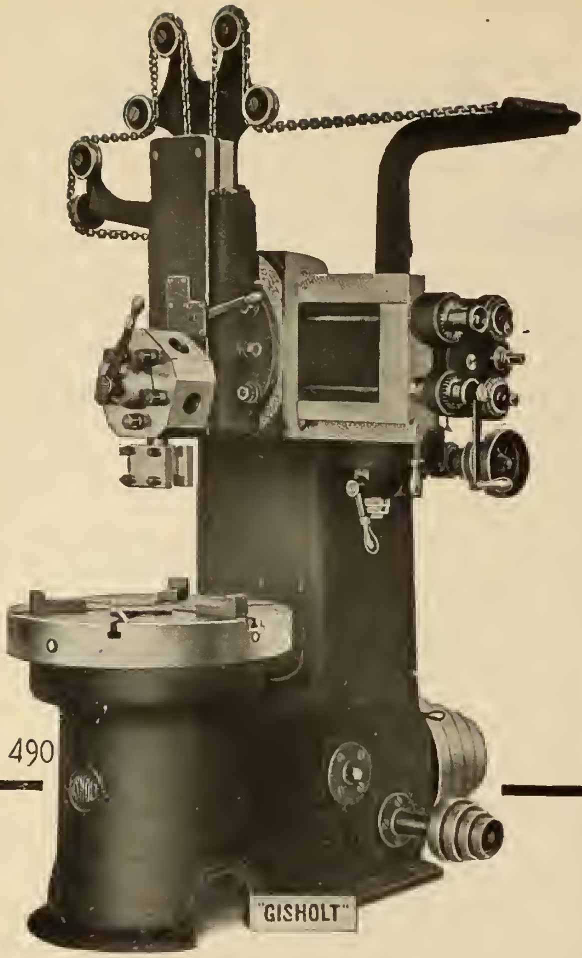

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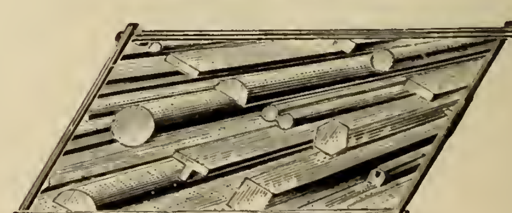

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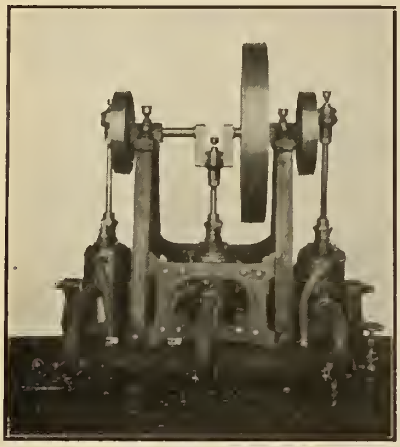

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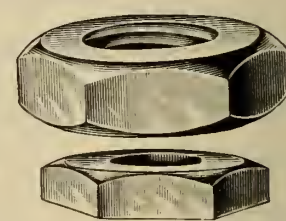

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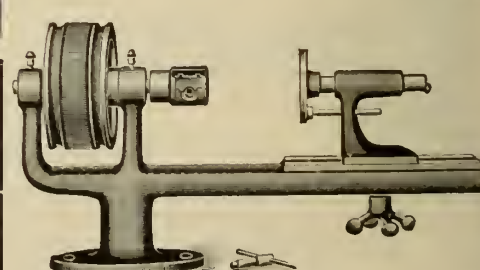

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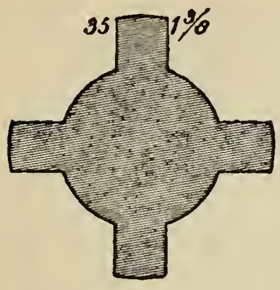

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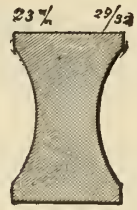

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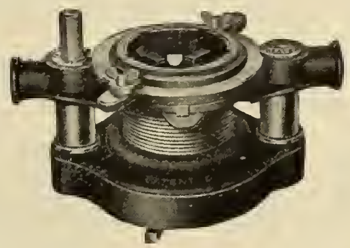

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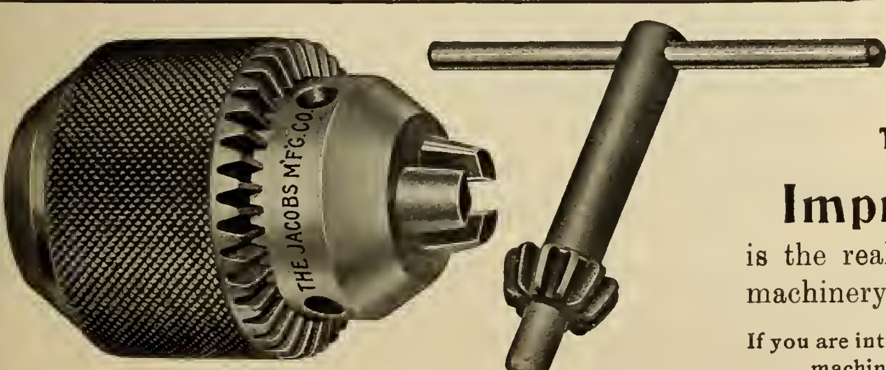

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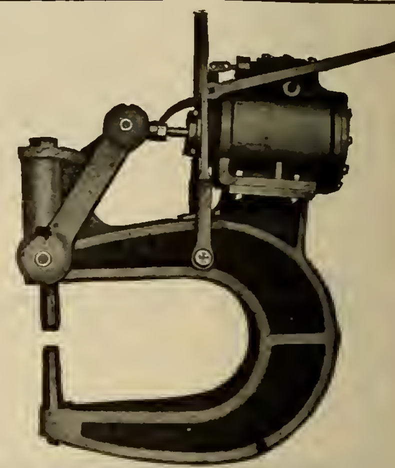

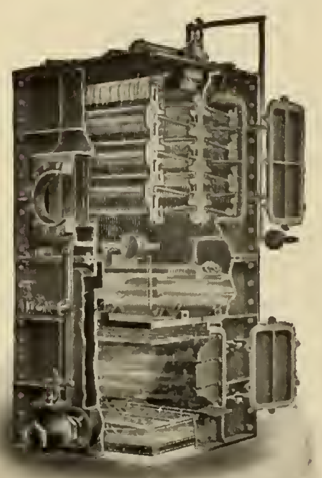

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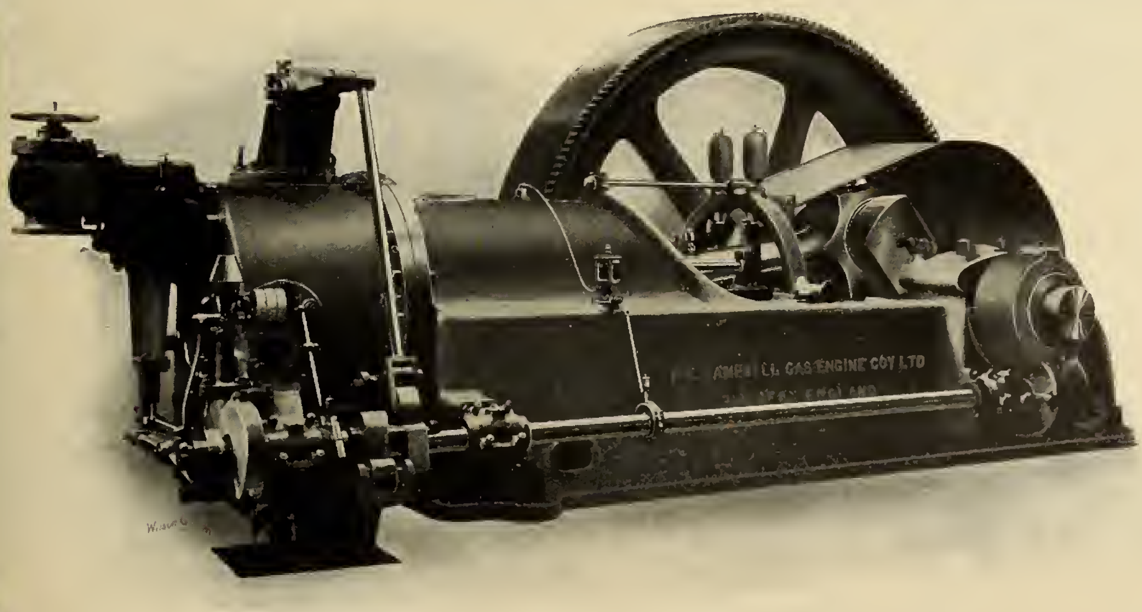

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Locating and Cutting Locomotive Eccentric Key-ways

The Method Adopted at the G.T.R. Shops, Montreal, to Obtain a Standard Position of the Key-way in the Sheaves, Jig and Miller Described.

By A. A. MAVER *

In new work or the renewal of main driving axles the locating of the eccentric keys and cutting of the key-ways by

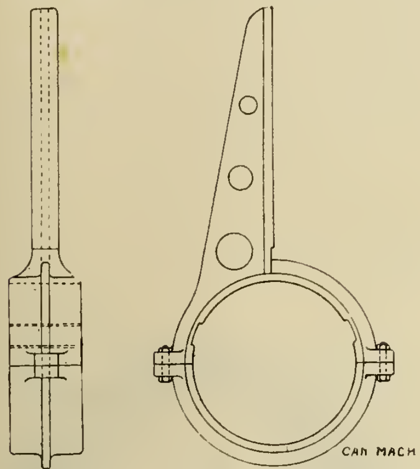


Fig. 1—Jig for Marking Eccentric Key Ways on Main Driving Axles.

the ordinary methods was a slow, tedious and laborious practice. The ordinary method was to do this work after the engine was wheeled, the valves set and the location of the keys found. The

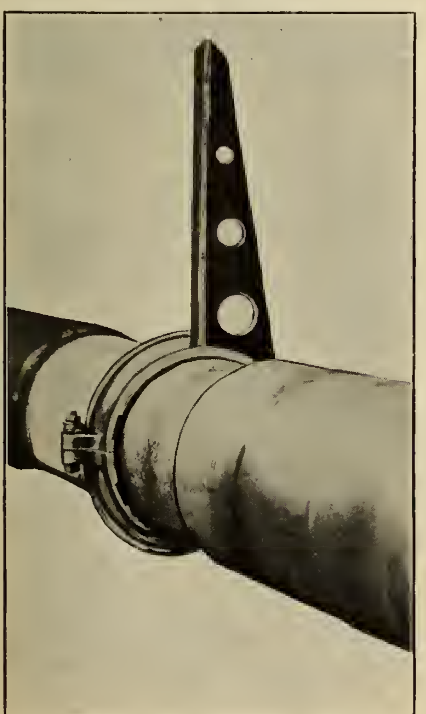
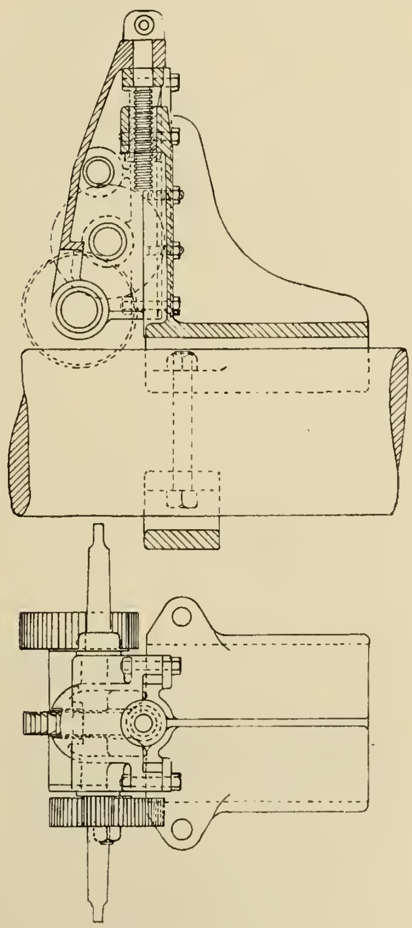


Fig. 2—Side View of Jig.

key-ways were then cut under the engine, the operation being performed in a very cramped space, the work having to be done in an awkward position, and, as a result, occupied about 15 hours in completing the operation.

Locomotive builders have different methods of locating the keys so as to apply them to the axle before the engine is wheeled, but the position of these keys is so far from being correct that they refrain from putting a key-way into the eccentric sheave until the valves have been set. The key-way is then cut in the sheave to coincide with the key-way in the axle.



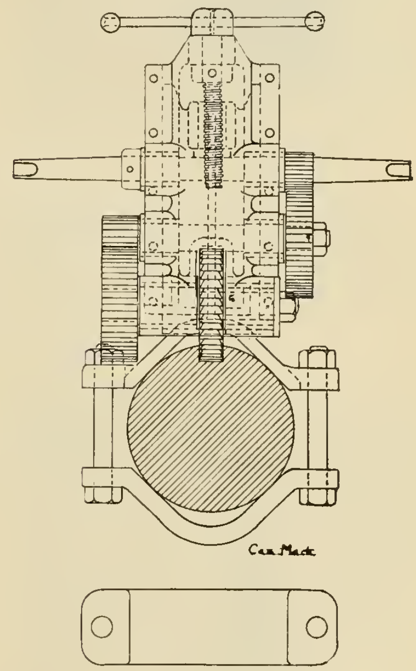


Fig. 3—Arrangement of Keyway Cutting Machine for Driving Axle.

The objection to this practice is that there is no standard position for the key-way in the sheave, also that the eccentrics and straps have to be removed and applied again under the engine. The key-way in the sheave should be in a standard position so that when main shops send sheaves to out-stations finished complete, there will be no danger of interference with the valve setting. For this reason the keys should be correctly located on the axle.

Various methods of doing this have been tried at the G.T.R. works, but the following has been adopted and used with satisfactory results in every way for over two years: By this method the key-ways in the axle are located by means of a jig, which is made as per Fig. 1, and to get the proper location of the key-ways on the jig the following operation is performed: After the engine has been thoroughly overhauled, wheeled and valves carefully set, the position of the key-ways is marked on the axle from the key-ways in the sheaves. The sheaves are then removed, the right-hand crank pin is plumbed in top position, the jig is then applied to the axle, as in Fig. 2, and after the jig arm has been carefully plumbed by line or spirit-level, the position of key-ways on the axle is marked on the jig. The jig is then removed and the key-ways

* Master Mechanic, G.T.R., Montreal.

cut in it. When marking off the key-ways on the left side of axle the jig is reversed.

One of these jigs is required for each class of engine. They are made of aluminum, and are, therefore, light and easily handled. They form part of the equipment of the wheel shop where the key-

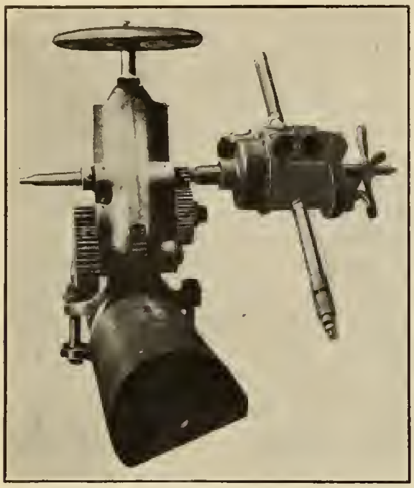


Fig. 4—Front View of Milling Machine Showing Air Motor Attached.

ways are located and sunk, keys applied and sheaves and straps put on before the wheels are sent to erecting shop.

The key-ways are cut with a machine gotten up for the purpose at these works, as per Fig. 3. The cutter is

Fig. 5—Side View of Milling Machine.

made 6 inches in diameter, and according to the width of the key desired. The machine is driven by an air motor, as in Fig. 4, and the feed applied by hand-wheel. The cutter is sunk to a depth of ¾ of an inch, the work of a few minutes. The bottom of the key-way being a long curve interferes as little as possible with the strength of the axle, while the centre depth of the key gives it a good heel to resist the thrust of the eccentric, and thereby lessens its liability to slacken and rock which is a common fault with shallow seated keys. Fig. 5 gives a side view of this jig.

The keys are made from steel castings, as per Fig. 6. These castings, which contain four keys, are machined to the diameter and width of the cutter. The square in the centre is also machined. They are then parted and are ready to be driven in key-way. The whole operation of marking off the four key-ways, cutting them and driving in the keys, is easily completed in less than one hour.

MACHINE-TOOL DESIGN AS AFFECTED BY THE USE OF HIGH-SPEED CUTTING TOOLS.*

By Professor John T. Nicholson.

The design of the lathe, the most important of all machine tools, has been greatly modified by the introduction of the high-tension steels. Much greater power, strength and rigidity are now necessary, and many faults of construction, always existing, have been laid bare by the severe tests imposed by the use of the new steel.

The power required depends upon the area of the cut, the force upon the tool, and the speed with which the cut is taken.

The first factor depends upon the size and nature of the work. In repetition work forging can be done closely to size, and only fine cuts need be taken. This appears to be the reason why American lathes are, on the whole, lighter than those of British design. In general engineering work, however, lathes which can take heavy roughing cuts are necessary, for it is cheaper to forge only approximately to size, an afterwards remove the excess material in the lathe, when a small number of pieces of any one kind are required. The amount which may nowadays be economically left on a forging is greater than it was, because it is less costly to produce a ton of shavings with high-heat steel than with low heat; not because the work required to machine off the ton is any less, but because the on-cost charge is smaller.

With regard to the second factor—number two—it is now known that the vertical pressure exerted on the point of a tool of ordinary shape is 100 tons per sq. in. for soft steel, and about 80 tons per sq. in. for cast iron. These figures appear not to vary much with either the area of the cut or its shape, and to be, to a first approximation, independent of the speed. The cutting force is thus the same whether carbon or high-heat steel is being used, and the standard cut having been assumed the same for both, the power required will depend only on the speed of cutting.

This leads us to the third factor, the cutting speed. The high-heat steel has increased the speed about threefold for the heavy and moderate cuts, and about five to sevenfold for light cuts.

The power required is therefore from three to sevenfold as great for high as for low-heat steel.

Heavy cuts are more economical than light, if both are taken at their appropriate speeds, because :

1. The high-heat steel will cut a greater weight per unit of time, without damage.

2. The gross power is less per unit of weight machined.

The highest spindle-speeds have been

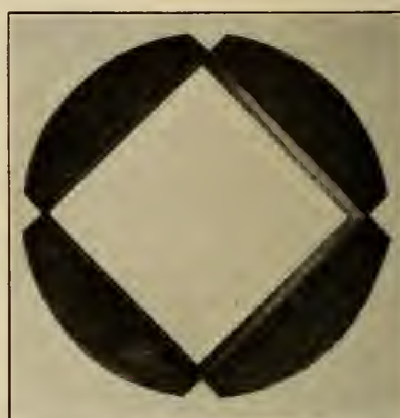


Fig. 6—Photo of Keys, Showing How They Are Made.

doubled throughout, whilst the lowest spindle-speeds have been increased tenfold for the smaller, and about twofold for the larger sizes. Thus the ratio of the greatest to the least is not so great as it was for the carbon-steel lathes. This means that, as the number of different spindle-speeds to be provided depends on that ratio, so many speeds and gears are not required for high-speed lathes as were necessary to secure a proper subdivision in a case of carbon-steel lathes, this being more especially true for the smaller sizes.

To enable them to transmit the great powers now required, much higher belt speeds have become necessary. The cone is now placed on a back-shaft and geared down to the spindle by spur and pinion. In this way speeds through the air of 2,000 or 3,000 feet per minute can easily be obtained, and unduly wide belts avoided. The efficiency of the belt-drive is also improved by using large pulleys running at moderate speeds, rather than small pulleys running at very high rates of revolution.

* From a paper read at the Engineering Conference of the Institution of Civil Engineers.

Canadian Variable Volume Rope Driven Compressor

Built by the Canadian Rand Co., Limited, for the British Columbia Copper Company—Dimensions, Action of Unloader, Test of Efficiency, Starter.

By H. V. HAIGHT *

The machine illustrated is a duplex-tandem compound compressor, each side being practically a complete machine. The principal dimensions are as follows: Diameter each low pressure cylinders, 25 ins.; diameter each high pressure cylinders, 16 ins.; stroke, 36 ins.; speed, rev. per minute, 85; displacement, cubic feet free air per minute, 3,474; rope wheel, diameter, 16 feet; diameter of ropes, 1½ ins.; number of rope grooves, 18; weight of wheel, 26,000 lbs.; weight of base-plate, 25,000 lbs.; total weight of machine, 110,000 lbs.; horsepower of driving motor, 600 h.p.

Built for Rope Drive.

This compressor was built for British Columbia, where most of the large motor-driven compressors in Canada are located. Practically all of the large motor-driven compressors in British Columbia are driven by ropes, on the Dodge-American system, with long centres, usually 55 feet. The diameter of the ropes is usually 1¼ in. or 1½ in. Fig. 2 shows the rope drive for the compressor. The rope wheel shown in the illustration, Fig. 1, is not the one belonging to the compressor, as its own wheel has already been shipped. Fig. 3 shows the wheel belonging to the compressor. It has a double set of arms, and there is an arm close to the joint on each side to support the heavy lugs.

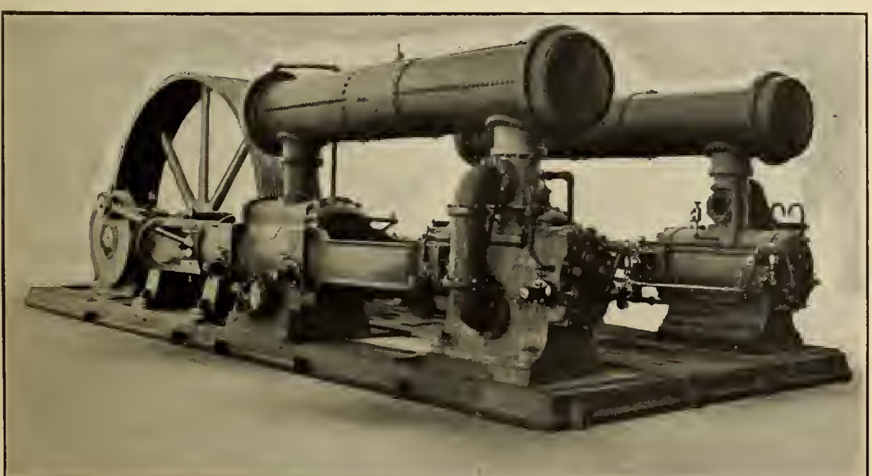


Fig. 1—Assembled View of Compressor.

The net area of the bolts in the rim joint is about 23 per cent. of the net area of the rim. At the rated speed of 85 R.P.M. the velocity of the rim is 4,250 feet per minute. The calculated stress is 490 lbs. per sq. in. in cast iron and 2,100 lbs. per sq. in. in the steel bolts. It is hardly possible for a machine driven by an alternating current motor to run much over its rated speed, but even at 41 per cent. higher speed, which would double the stresses, the wheel would still be absolutely safe.

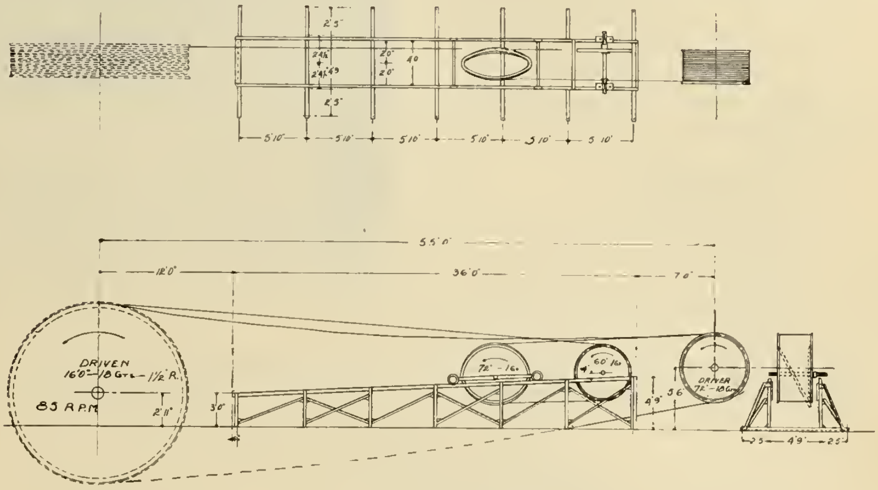


Fig. 2—Rope Drive.

The amount of air compressed may be varied to suit the requirements by a method of unloading the cylinders. The inlet valves on both high pressure and low pressure cylinders are of the Corliss type with releasing gear but without dash pots. When the piston is compressing air the valve does not release, but is opened by the eccentric a little after the beginning of the suction stroke (about 3 per cent. to allow for the expansion of the air in the clearance space) and closed by the eccentric at the end of the stroke. The action of the unloader is to admit air to the trip cylinder which pushes out the plunger, pushes down the trip cam, and releases the hook. The valve then remains open and the air blows freely in and out of the cylinder. The valve is prevented from moving too far when released by the stop on the outer valve bonnet shown in Fig. 4.

There are eight Corliss valves, and the unloader shown in Fig. 5 unloads them in pairs in the following order:

1st Stage—Left hand low pressure front valve and left hand high pressure rear valve.

2nd Stage—Right hand low pressure front valve and right hand high pressure rear valve.

3rd Stage—Left hand low pressure rear valve and left hand high pressure front valve.

4th Stage—Right hand low pressure rear valve and right hand high pressure front valve.

The first stage unloads and with the other stages, 2, 3 and 4, gives the following variations in capacity: Full load; ¾ load; ½ load; ¼ load; no load.

At whichever stage the machine is working the cylinder ratio is the same, and whatever air is being delivered, is

* Chief Engineer, Canadian Rand Company, Limited.

being compressed at full compound efficiency.

The small weights, shown dotted inside the large weights in Fig. 5, are arranged to be picked up or dropped one at a time, at each stage, so that not more than a quarter of the load will be thrown off or on at one time. Throwing on one-quarter of the load at a time does not produce any perceptible rush of current in an A.C. motor, while a large compressor in which the whole load is thrown on and off suddenly is apt to produce surges in the line. An advantage of this method of unloading is that at the sa ne time that it reduces the power it also reduces the pressure on the journals, when the capacity is reduced to one-half, the load on the bearings is also reduced to one-half and when there is no load on the cylinders there is no working load on the bearings.

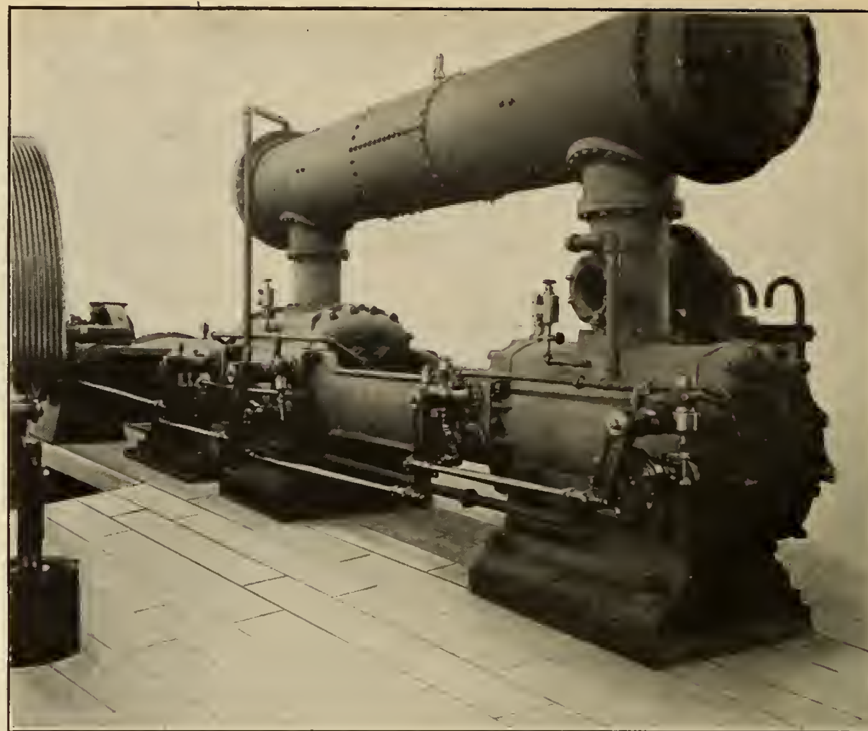


Fig. 4—Valve Side of Air Compressor.

A Test of Efficiency.

A test was made between this compressor and one with vacuum control. The two machines were exact duplicates, running under the same conditions, except that one had a choking unloader in the inlet pipe and the other had the four stage unloader described

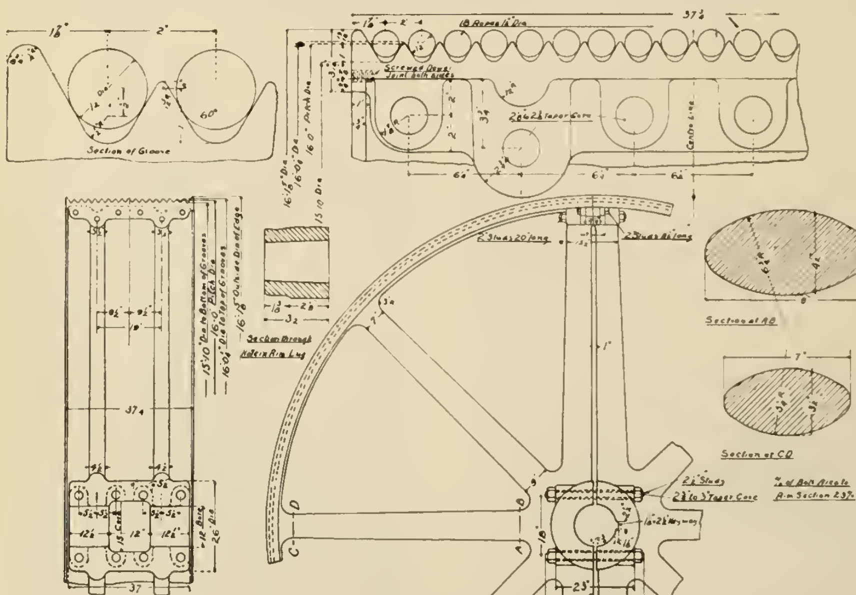


Fig. 3—Sixteen Foot Rope Wheel.

above. Readings taken on the same day showed a discharge temperature of 221 degrees Fahr. for the machine with four stage unloader, and 240 degrees Fahr. or more for the one with the choking unloader. The mercury went to the top of the thermometer, how much higher it would have gone is not known. Another machine of the same size with choking unloader and running under the same conditions, showed on the same day a discharge temperature of 278 degrees Fahr. The latter machine was, however, of a different make, and had a very small intercooler.

The air is hotter with vacuum control than where the inlet valves are held open and the air allowed to blow in and out freely. The calculated temperature of compression is ;

$$T_2 = T_1 \left(\frac{P_2}{P_1}\right)^{0.29}$$

where T_2 and T_2 are the initial and final absolute temperatures and p1 and p2 are the initial and final absolute pressures. The final absolute temperature varies directly as the ratio of initial and final pressures. When drawing a vacuum the initial pressure is very low, while the final pressure remains the same as in regular working, hence the compression ratio is high and the temperature is high. On the other hand when the inlet valves are held open, as in the four stage unloader, the air blows in and out of the cylinder freely, the ratio of compression and the rise of temperature are practically zero and the cylinders get a chance to be cooled by the water jackets.

The absolute temperature of the discharge is a rough measure of the work

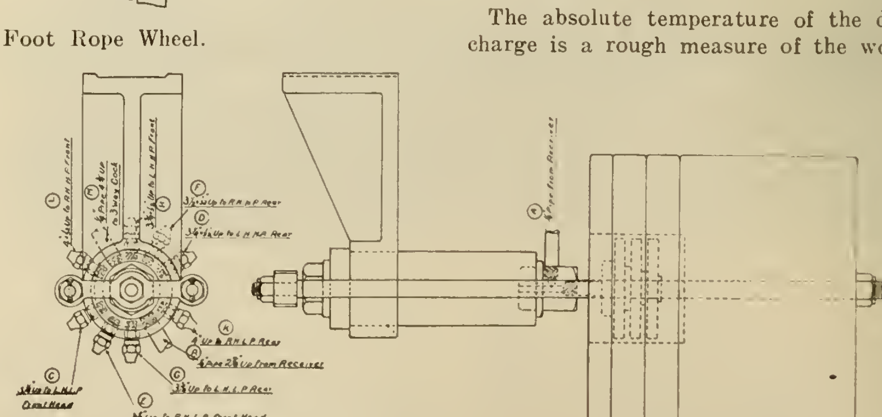


Fig. 5—General Arrangement of 4-Stage Unloader.

of compression. In the instance given above where the discharge temperatures were 221 degrees, 240 degrees, and 278 degrees, the work of compression would vary as :

221 deg. + 460 deg.=681 deg.=100 per cent.
240 deg. + 460 deg.=700 deg.=103 per cent.
278 deg. + 460 deg.=738 deg.=108 per cent.

showing an apparent saving of about 3 per cent. in favor of the four stage unloader. The compressor with four stage unloader can, if necessary, run all the time at 25 per cent. of its capacity.

A summary of the good points of the duplex-tandem compressor with four stage unloader is as follows :

1. High efficiency of compression due to maintaining constant intercooler pressure and proper cylinder ratio.
2. Load is thrown on and off gradually, producing no disturbance in electric lines.
3. Reduces load on journals at part loads.
4. Delivers cooler air than vacuum control, thus also saving power.
5. Maximum demand for current varies approximately with the requirements for air.

Air Supply to Unloader.

In order that the unloader may remain sensitive it is desirable that the air supplied to it should be clean, cool and dry. Fig. 6 shows an arrangement for this purpose and also a starting device, described later. The air supply is taken from the main receiver (not shown) and passes through a length of water-jacketed pipe to cool it and condense the moisture. The moisture and any scale will collect in the 30 gallon tank shown. From the 30 gallon tank two pipes lead to the unloader, one to the bottom and one to the middle. The pipe to the bottom of the unloader raises the weights, while the pipe to the middle supplies the air which operates the trip cylinders. If these two pipes were combined in one, then the unloader would "hunt" or "dance" on account of the drop in pressure in the small pipe, caused by air being drawn off to operate the trip cylinders.

The 40 gallon tank is intended to hold air over noon or night so that the machine may be unloaded before starting. By turning the three-way cock, air is admitted by the upper pipe to the exhaust ports of the unloader and from there to the trip cylinders, and releases all the Corliss valves so that they remain open and the machine starts up without load.

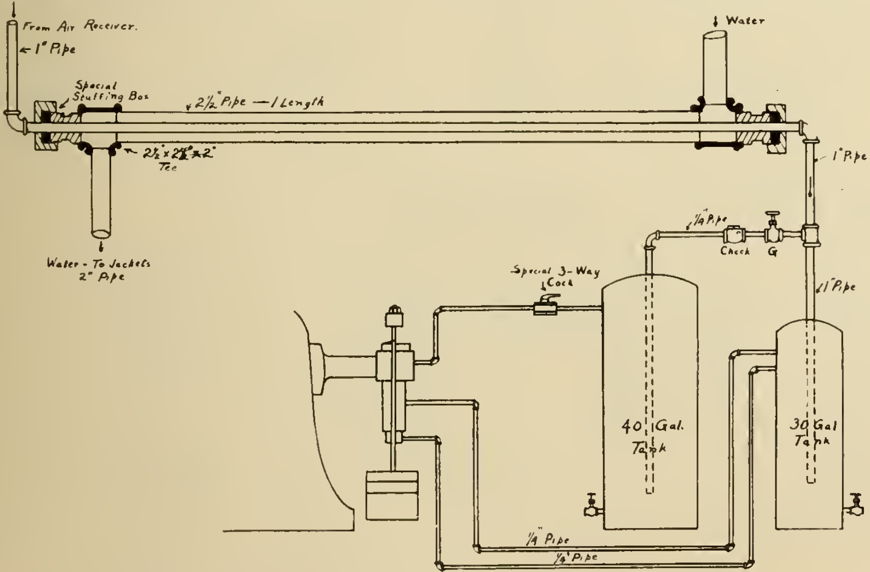
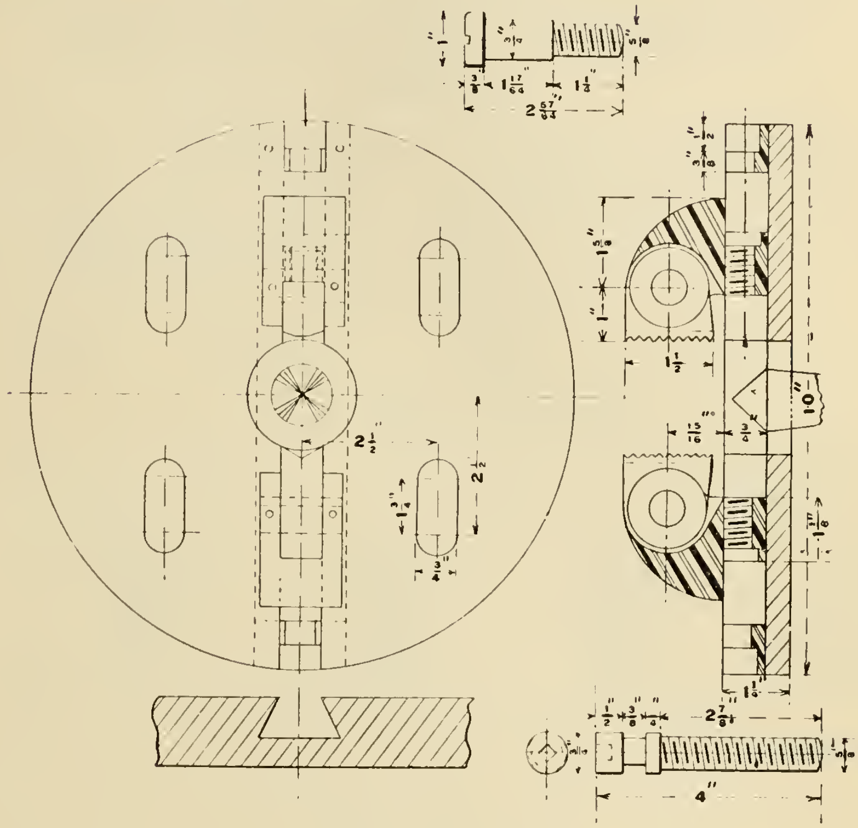


Fig. 6—Four-Stage Unloader—Air Supply Connections.



A Universal Lathe Dog.

A UNIVERSAL LATHE DOG.

The American Tool Works Co., Cincinnati, uses on its high-speed lathes, what it knows as the universal dog, which was designed to, and does, save a vast amount of time in turning work. At first glance it appears more like a chuck than a dog. However, as it i only used on work which is turned on centres, it cannot be classed as a chuck. The accompanying drawings show its construction. A plate carries two sliding pieces on which are two swiveling jaws, one of which is recessed and the other pointed. These jaws are actuated by independent screws with a recess for a square ended wrench. The plate has four slots through which the special screws shown are inserted to fasten it to the face plate. Further explanation of the construction of the device is unnecessary, as the drawings show its construction in detail. In operation the work being turned is placed on the lathe centres and the jaws closed down on it, and the operator is then ready to immediately begin turning. The jaws were made independent so that irregular shaped or eccentric work could be handled. The swiveling of the jaws also permits the gripping of tapered work without any attention on the part of the operator. A device of this kind effects an immense saving of time over the use of the standard tail dog, which has to be slipped on the work, moved up to the face plate and tightened.

Simple Time and Cost System for Small Shops

A System to Record Time and Cost of Machine Shop Operations with Little Detail Work. Used in Shop of A. B. Jardine, Hespeler.

By A. JARDINE.

Having noticed several cost systems described in Canadian Machinery, more or less elaborate, I thought that the system in use by A. B. Jardine & Co., might be of interest to some of your readers.

It does not go into cost in every detail, but is only to find shop cost, that is, the cost of the several operations on any piece of a machine and also as a means of checking the time on the same operation on different lots made at different times.

To illustrate, I will take a piece of a pipe stock made in our works.

The different operations on this piece are boring, facing, slotting, drilling and tapping.

A number of operations common to the work in the shop are printed on the workman's time sheet, Fig. 1.* Any operation not on the sheet is filled in by the workman.

A job number card, Fig. 2, enclosed in a tin case with a piece of mica to cover to keep from dirt. (This card goes with the job in all the several operations) is sent to the shop. The storekeeper gets the material and reports on material card as in Fig. 3.

The first operation is boring. The workman makes out a time sheet by filling in the date, job number, workman's number, draws pencil through operation on time sheet, writes in name of job to save mistakes, and signs his name, Fig. 4.

Each day the time is carried from these time sheets to a book called "Time Record Book," a copy of one of the loose leaves from which is shown in Fig. 5.

On the last sheet that workman sends in on any operation, he stamps with rubber stamp, "Operation finished, number finished," and fills in number finished as in Fig. 6.

By this means record is kept of any losses and by whom they are lost.

When operation "boring" is reported finished, the total number of hours are carried to book called "Time Cost Book," with operator's number, as in Fig. 7, and average hours per 100 filled on next line in red ink.

This is carried through with all the other operations.

Date	Job No.	Workman's No.	Hours

Name of Job—

Annealing	Forging	Polishing	Straightening
Boring	Facing	Punching	Slotting
Bending	Gear Cutting	Turning	Sorting
Case Hardening	Grinding	Threading	Stamping
Centreing	Hardening	Tapping	Sq. Heads
Cutting Off	Key Seating	Tempering	Scrunting
Cutting to Length	Milling	Testing	Setting
Drilling	Mouthing	Turning and Boring	Shaper
Filing	Planing	Reaming	
Fitting Up	Plating	Relieving	

Remarks:

A. B. JARDINE & CO.

.... **Signature**

Fig. 1—Workman's Time Sheet.

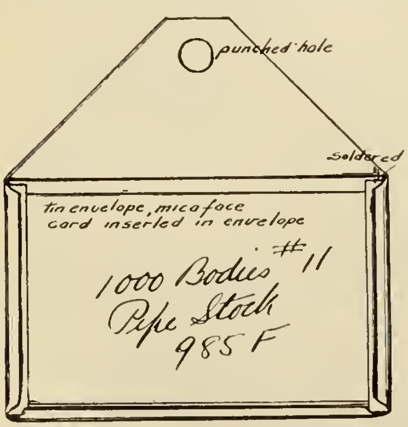


Fig. 2—Tin Envelope to Hold Order Card.

* The different figures illustrating this article are not exact reproductions of the original time sheets, but for the sake of convenience were set up in type to resemble the original sheets as closely as possible.

Date	Job No.	Workman's No.	Hours
22—2—08	985F	86	10

Name of Job—Body No. 11 Jardine Pipe Stock.

Annealing	Facing	Punching	Slotting
Bending	Gear Cutting	Turning	Sorting
Case Hardening	Grinding	Threading	Stamping
Centreing	Hardening	Tapping	Sq. Heads
Cutting off	Key Seating	Tempering	Scrunting
Cutting to Length	Milling	Testing	Setting
Drilling	Mouthing	Turning and Boring	Shaper
Filing	Planing	Reaming	
Fitting up	Plating	Relieving	
Forging	Polishing	Straightening	

Remarks:

A. B. JARDINE & CO. R. SMITH,

.... **Signature**

Fig. 4—Workman's Time Card.

When the article is finally finished the rate per hour is filled in on time record sheet, Fig. 5, and totalled.

The cost of these several operations are then carried to "Cost Record Book," Fig. 8. These several books consist of loose leaves, copies of which leaves appear in the several figures. The comparative cost of the same article made at different times is seen at a glance. Also the comparative time cost in hours is seen on sheet, Fig. 7.

For example, I have carried boring on 450 bodies to sheet, Fig. 7, which is 10 hours per 100; whereas the time on last lot was 9 hours per 100.

THE VERTICAL MILLING MACHINE IN STEAM TURBINE MANUFACTURE.

The adaptability of the vertical miller to special operations not readily performed by any other type of machine is illustrated in Figs. 1 and 2. In both cases buckets were required to be cut respectively in the side and in the circumference of the disc of a Sturtevant steam turbine. The difficulty of properly rigging up any other form of machine to do this work must be apparent. But the vertical milling machine presents a depth of throat, a range of movements, and a relation of spindle to platen that renders the operations comparatively simple.

In each case illustrated the machine was a No. 6, manufactured by the Becker-Brainard Milling Machine Co., Hyde Park, Mass., with standard dimensions as follows: Size of platen, 49 inches by 18 inches; length of saddle, 60 inches; longtitudinal feed (automatic), 50 inches; cross feed with automatic stop, 20 inches; and vertical feed of spindle (automatic), of 13 inches. The greatest distance between spindle and platen is 30 inches, and between centre of spindle and neck is 24 inches. The discs being operated were 26 inches in diameter, forged of open hearth steel.

In each case the disc is mounted upon and clamped to a circular slotted edge jig plate, which revolves freely about a pin projecting from a circular base plate which is securely clamped to the platen. The diameter of the pin is the same as that of the turbine shaft; and the slots in the jig plate correspond in number and spacing to the buckets to be milled in the disc. A spring pawl or pin holds the ring in place as each bucket is milled.

For the milling of the radial bucket disc the entire rig is mounted on a tilting plate of skeleton construction attached to the platen of the machine; the upper portion being hinged so that it can be adjusted and locked at any angle. Subject to the action of adjustable stops the cutter is fed to cut the bucket re-

MATERIAL

	Babbit	Wro't Iron	Tool Steel (best)
Cast Iron	C. R.	Mach. Steel	Tool Steel (common)

Name of Job—1000 Bodies No. 11 Pipe Stock.

Lbs.	Number of Articles	Job No.	Workman's No.
5147	1000	985F	45

A. B. JARDINE & CO.

Fig. 3—Material Card.

Job No. 985F.

1,000 Bodies No. 11 Pipe Stock.

Week Ending		M.	T.	W.	T.	F.	S.	Total.	Rate.	Amount.	Remarks.
1908	Workman's No.			Material				Lbs. 5,147	05	$257 35	
				Boring							
25—1	86	......	......	10	10	10	5				
1—2	86	10	10	10	10	10	5	90	60	54 00	1,000 finished.
				Facing							
8—2	40	......	10	10	10	10	5				
15—2	40	4	......	......	......	......	......	49	60	33 40	1,000 finished.
				Slotting							
22—2	53	......	10	10	10	3	......	33	55	18 15	998 finished.
				Drilling							
29—2	15	10	10	10	10	10	5				
7—3	15	10	8	......	......	......	......	73	50	36 50	998 finished.
				Tapping							
7—3	15	......	2	10	10	10	5				
14—3	15	6	......	......	......	......	......	43	50	21 50	998 finished.
										420 90	$42.17 per 100

Fig. 5—Copy of Loose Leaf from Time Record Book.

Date	Job No.	Workman's No.	Hours
1—2—08	985F	86	5

Name of Job—

Annealing	Facing	Punching	Slotting
Bending	Gear Cutting	Turning	Sorting
Case Hardening	Grinding	Threading	Stamping
Centreing	Hardening	Tapping	Sq. Heads
Cutting off	Key Seating	Tempering	Scrunting
Cutting to Length	Milling	Testing	Setting
Drilling	Mouthing	Turning and Boring	Shaper
Filing	Planing	Reaming	
Fitting up	Plating	Relieving	
Forging	Polishing	Straightening	

Remarks:

OPERATION FINISHED.

NUMBER FINISHED 1000.

A. B. JARDINE & CO. R. SMITH, ... **Signature.**

Fig. 6—Workman's Time Card.

Bodies No. 11 Pipe Stock.

Date.	Quantity.	Job No.	Boring.		Facing.		Slotting.		Drilling.		Tapping.			
			Workman's No.	Hours.	Workman's No.	Hours.	Workman's No.	Hours.	Workman's No.	Hours.	Workman's No.	Hours.	Workman's No.	Hours.
Number finished	....		1,	000	1,	000	9	98	9	98	9	98		
9—3—'08	1,000	985F	86	90	40	49	53	33	15	73	15	43		
Hours per 100.........	....			9		4.9		3.3		7.3		4.3		
Number finished ..	....			450										
	450	468F	86	45										
Hours per 100	......			10										

Fig. 7—Copy of Loose Leaf from Time Cost Book.

Bodies No. 11 Pipe Stock.

Date.	Quantity.	Job No.	Boring.	Facing.	Slotting.	Drilling.	Tapping.			Material.	Total.	Average per 100.
Number finished	....		1,000	1,000	998	998	998					
9—3—'08	1,000	985F	$54.00	$33.40	$18.15	$36.50	$21.50			$257.35	$420 90	$42.17

Fig. 8—Copy of Loose Leaf from Cost Record Book.

cesses at an angle out of the solid forging.

In the particular case shown in Fig. 1, the platen is necessarily brought forward by the cross-feed until the bucket is in the centre line of the spindle, i.e., namely, with the entire disc in front of the spindle. But in the case of other sizes the disc with its tilted bed is set at right angles to the position shown in Fig. 1. This brings the centre of the disc into the longitudinal centre line of the platen and projects half of its diameter back into the throat.

The value of relatively great distance

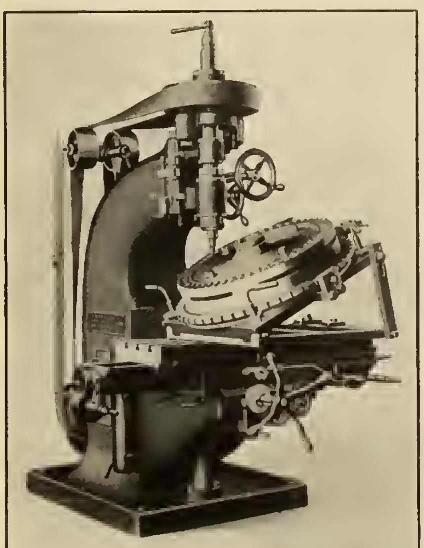


Fig. 1—Vertical Milling Machine in Turbine Practice.

between centre of the spindle and neck of the machine is thus shown, although even more directly by the arrangement in Fig. 2. Here the slots are being melted in the outer rim of the disc by the horizontal attachment for the axial type of turbine, the disc being flat on the platen.

The attachment shown in Fig. 3 consists essentially of two parts, the upper, which is stationary, and the lower,

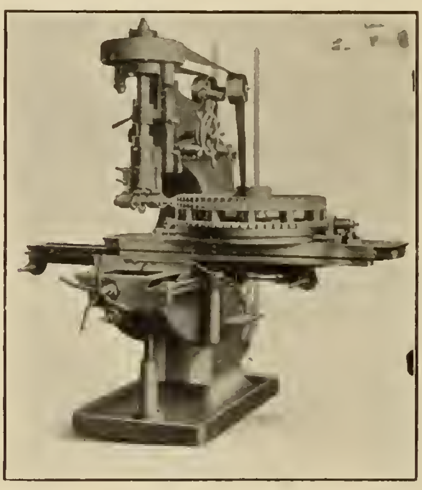


Fig. 2—Vertical Milling Machine in Turbine Practice.

which may be revolved in a horizontal plane beneath the upper. Graduations upon the surface of the latter permit of accurate adjustment of horizontal spindle to any angle; T headed bolts in T slots lock it in place. The horizontal spindle, supported at both ends, carries a bevel gear which is driven by a corresponding gear with taper shank inserted in the vertical spindle. End play on the horizontal spindle is taken up at one end by nut and checknut, while at the other end provision is made for securing a cutter, either by key and clamping nut or by insertion of taper shank in the end of the spindle.

At the intersection of the centre lines of the horizontal and vertical spindles may also be inserted a cutter for general use, but specifically for cutting spirals. This is held between two nuts, one of which is graduated at that adjustment; having once been made for any given thickness of cutter it may be duplicated for the same cutter.

Manifestly this attachment materially increases the scope of the vertical miller. It gives it the same range as the horizontal type in the cutting of worm and spur gears, spirals, hobs and rocks, while it retains other characteristics peculiarly its own.

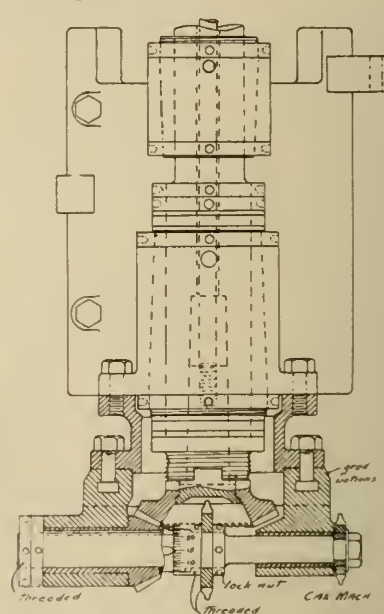


Fig. 3—Milling Machine Fixture.

THE MANAGER'S ASSISTANT.

"Jimmie," said the general manager, solemnly, at the eleventh hour, "we have forgotten to get a fresh supply of stamps."

And the office boy in his excitement, responded with "Goodness, sir, so we have! If we ain't a couple of blunder-headed idiots!"

There are two ways of acquiring—one is to produce and the other is to rob the producer.

Test of 90-inch Wheel Lathe in G.T.R. Shops, Stratford

Test of Heavy Wheel Lathe Built by London Machine Tool Company, Upon Which Fourteen Sets of Driving Wheels Can be Turned Out.

Herewith is illustrated in Fig. 1. a 90-in. extra heavy driving wheel lathe made by the London Machine Tool Co., Ltd., Hamilton, and installed in the Grand Trunk shops at Stratford, Ont.

This lathe was designed for very heavy requirements, and since being put into operation tests have shown the machine to do remarkable work.

In Fig. 2 will be found tabulated results of a test made on this wheel lathe, and when it is considered that the machine has only been in operation a very short time, the results are very creditable. With more experience less time will be taken in removing and replacing wheels, and the officials are quite confident that 14 sets of wheels per day can be produced. On a test subsequent to the test tabulated, 8 sets of wheels, 6 old and 2 new, were turned in the remarkably short time of 5 hours and 50 minutes. Cuts on this machine have been taken 1⅛ inches deep and 5-16-in. feed at speeds up to the limit of the high speed tool steels used. In ordinary practice, it is found that from 12 to 18 feet is about the range ; but where hard spots are encountered the speed must be very materially reduced. For finishing, speeds as high as 20 to 22 feet per minute can be obtained.

In turning new tires, in which there is not a great amount of stock to be removed, the procedure consists of taking a wide facing tool and forcing it into the tread of the wheel until the desired diameter is obtained ; and, as a rule, about two revolutions of the wheel is sufficient for this. For turning old tires the tool is set within 1-16-in. of the diameter required and feeds of either 32-100 or 48-100 of an inch per revolution are used. The flange is also reduced to the proper diameter with the same tool. A wide tool is then used to bring the tread to diameter. The outside of wheel is bevelled off and right and left-hand forming tools are used to form a flange.

The machine is driven with a 60 h.p. type "S" Westinghouse motor, variable speed; and for moving the left-hand head it is equipped with a 5 h.p. Westinghouse motor.

As will be noticed from the general appearance, the lathe is very massive. All parts are designed for exceptionally heavy strains. It is estimated that the cutting pressure on the two tools will be as high as 300,000 lbs. A person can get an idea of how large the proportions of this machine must be to stand these enormous pressures.

The face plates are 91 inches in di-

Tire No.	Kind	Diameter	Time Starting	Cutting Speed	Feed Per Rev	Time Finished	Depth of Cut	Cutting time	Changing time	Total Time	Tool Steel	Remarks	Condition of Tools
1	B V G	65"	8.00 a.m	21′	5-16	8.35a.m.	3-16	35 min.	13 min.	48	Rex A	New Tires	Good
2	"	"	8.48 "	21′	"	9.15 "	3-16	27 "	9 "	36	"	New Tires	Fair
3	"	"	9.24 "	17′	"	10.03 "	3-8	38 "	8 "	46	Ark	Old Tires	1 tool destroyed
4	"	"	10.10 "	14′	"	10.51 "	½	40 "	6 "	46	Rex A	Old Tires†	2 tools destroyed
5	"	"	10.56 "	11½′	"	11.40 "	5-16	43 "	8 "	51	"	Old Tires	Good
6	"	"	11 47 "	17½′	"	1.25 p.m	3-8	37 "	8 "	45	Ark & Rex A	"	Good
7	"	"	1.32 p.m	14′	"	2 08 "	3-16	35 "	8 "	43	Mushet	"	Good
8	"	"	2.15 "	15′	"	2.47 "	3-8	32 "	Taking out 3	35	"	"	Fair

Summary—8 prs. 5 hrs. 59 min. Average total time, 43.75 min.=13.71 prs. per 10 hrs. Average cutting time 35.87 min.

†Very hard.

Fig. 2—Copy of Report of Test of 90-inch Wheel Lathe Made by G.T.R. at Stratford on March 8.

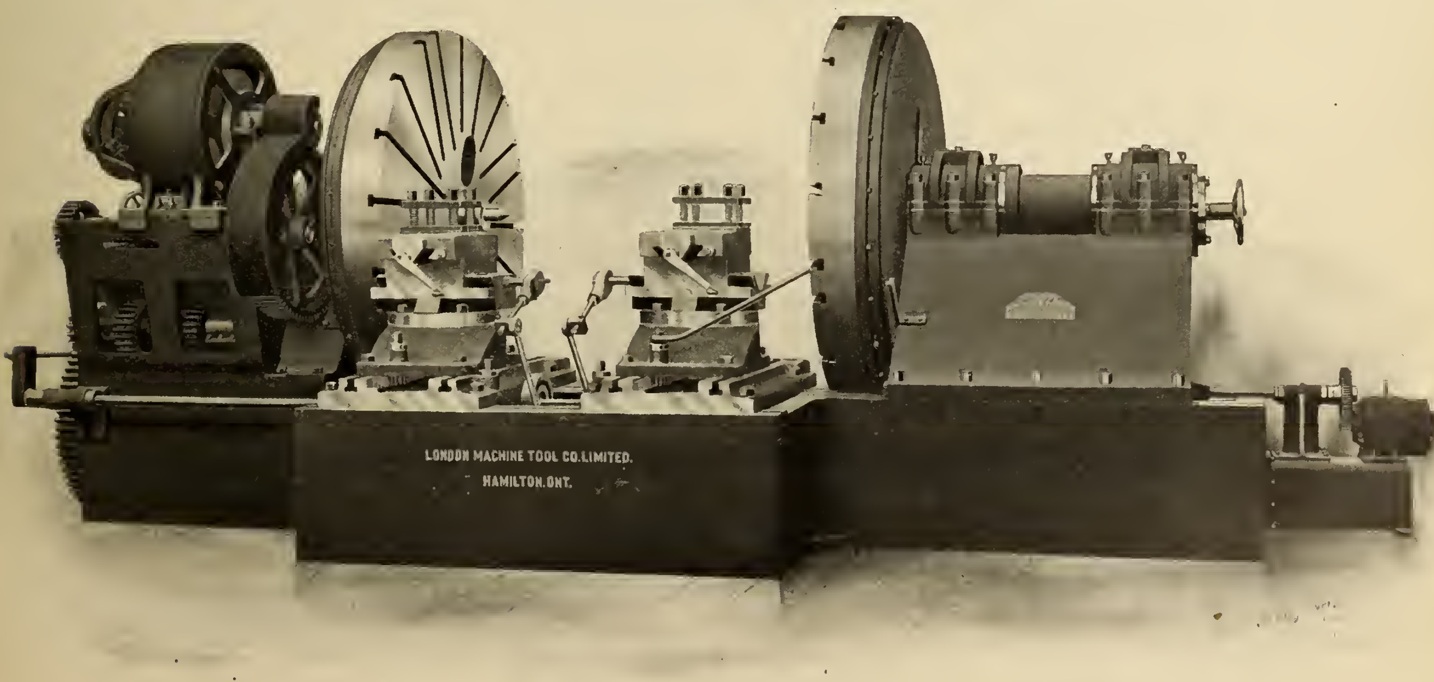


Fig. 1—Ninety-inch Wheel Lathe, London Machine Tool Co.

ameter, allowing wheels to be turned 86 inches diameter on the tread. The bearings are all very large, being 16 inches diameter by 22 inches long. The feeds vary from 16-100 of an inch per rev. to 48-100 of an inch per rev., having eight impulses per revolution.

The left-hand head is moved backwards and forwards by means of a motor working through friction clutch into a screw placed directly under the centre of gravity of the head. This obviates the twist and heavy starting torque required to move a head operated by rack and pinion placed on one side.

By means of clutches and change gears means are provided for supplying working speeds for all wheels from 86 inches diameter to 34 inches diameter, so that coach wheels may also be turned.

The weight of this machine complete is about 102,000 lbs.

MACHINE-SHOP NOTES.

By James Watson.

It is not always the large eye-filling parts of machines which cause the most trouble to the machine-shop foreman, for in many cases the minor, insignificant details take up time and give trouble out of all proportion to their size and importance. Most of the principal parts give no trouble, once the foreman is sure that the workman understands his drawing, as the machinery must follow upon stereotyped lines. It is difficult, however, with many of the minor parts, which are designed to suit the part they have to fill in the machine, without giving a thought of how they are to be machined, so that they cause an amount of trouble in the shop which would surprise no one more than the draughtsman who designed them.

Sometimes the draughtsman is not to blame, as his design is simple in every respect, except machining, and he trusts to the machine-shop foreman to surmount successfully any difficulty which may arise. The writer's experience with two small articles which were awkward to machine cheaply and accurately, but which gave no trouble after being treated as described, may be of interest and give assistance to others who have similar work to perform.

Fig. 1 shows a valve seat, and the trouble with it was in getting the face correctly to dimensions. This, even with a good man, was a slow process, as the manipulation of so many pairs of calipers, and the fixing of so many sizes, were bound to be. As a forming tool could not be used, owing to the ribs between the faces, a milling cutter (Fig. 2) was made, and fitted to the turret head of a small double-headed vertical mill of the "Bullard" type. The seats were chucked, drilled, and reamered, and a roughing cut taken off the face; the cutter was then brought down on the face and finished it off at one operation. Only one cutter was required, although both chucks were fully employed on the seats, as it could be slipped out of one turret socket into the other in a few seconds; and while one seat was being milled, another was being drilled and prepared for the cutter, thus keeping both chucks fully employed.

Fig. 3 shows an oil-pump disc. Here the original method employed in machining it was to grip it in the chuck of a small lathe and face one side and turn as much of the outside as possible; then to reverse, and after the usual truing up, finish off. This method was not only slow, but tended to leave a joint on the outside, and the work got sprung out of round. To rectify this a mandrel (Fig. 4) was made from a piece of round bar turned to fit the inside of the discs, and having the central part cut away. On this mandrel eight discs, after being faced, could be turned at one time, were free from danger of distortion, and could be filed and polished or ground if desired. The next operation (drilling, reaming and recessing) was performed in the following manner:

The angle plate (Fig. 5) was carefully machined as shown, the spigot at the back being fitted to a recess in the chuck of a small capstan lathe. The recess in the angle plate was just half the depth (from the centre of the lathe) of the disc over-all thickness. Four small pegs kept the centre part parallel to the lathe centre, and as the nuts on the fixing studs just passed between the inside of the rims and the centre barrel of the disc, the discs when finished could be easily removed without taking off the nuts, as the plate (Fig. 6) was made with slots so as to slip off when nuts were eased.—Mechanical World.

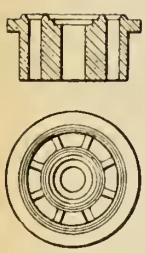


Fig. 1.

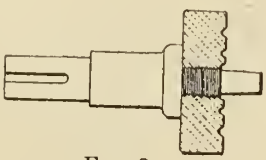


Fig. 2.

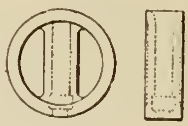
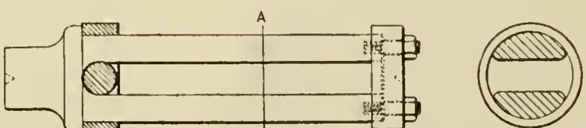


Fig. 3.



Section at A B.

Fig. 4. Machine-shop Notes.

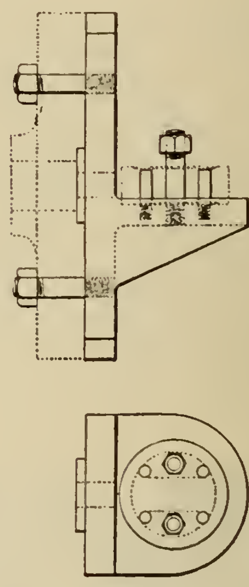


Fig. 5.

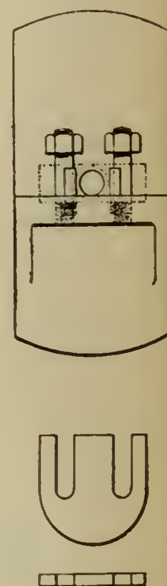


Fig. 6.

CANADIAN RAILWAY CLUB.

Notices have been sent out by the Canadian Railway Club offering a free scholarship, covering four years' tuition in the Faculty of Applied Science in McGill University, subject to competitive examinations, to the sons of members of the Canadian Railway Club under twenty-one years of age.

The examination, which will be the regular entrance or matriculation examination provided for in the annual calendar of the Faculty of Applied Science of McGill University, will be held beginning June 15th. The candidate making the highest average will be awarded the scholarship and will have the privilege of taking a course in Civil, Mechanical or Electrical Engineering or the Theory and Practice of Railways. The scholarship will be renewed from year to year, only upon the holder passing satisfactorily the regular examinations of his course.

Applications for certificates entitling eligible persons to enter the competition should be addresed to Mr. James Powell, secretary Canadian Railway Club, Montreal.

The annual meeting of the Canadian Railway Club, for the election of officers, will be held on May 5th in the Windsor Hotel, Montreal.

MACHINE SHOP METHODS AND DEVICES

Unique Ways of Doing Things in the Machine Shop. Readers' Opinions Concerning Shop Practice. Data for Machinists. Contributions paid for.

TURNING FOUR-THROW CRANK.

By Frank E. Booth.

The usual well known method of supporting the crank shaft of an engine while performing the operation of turning the crank pin is to use two crank-centre blocks such as shown in Fig. 1.

When the shaft has two or more throws, it becomes necessary to shift the crank-centre blocks from one pin centre to the other, as the job proceeds; this

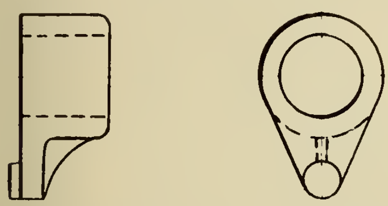


Fig. 1—Turning Four Throw Crank.

takes considerable time and also leaves an opening for errors while setting the crank-centre blocks in their several positions.

Some time ago I had a four-throw crank job, Fig. 2, on my hands and succeeded in accomplishing it in the following manner with a minimum amount of work in setting the job up, as well as securing a more accurate spacing of the crank pin centres.

We happened to have two heavy cast iron flanges, as shown in Fig. 3; these were turned and bored to fit the shaft after it had been roughed out. The four

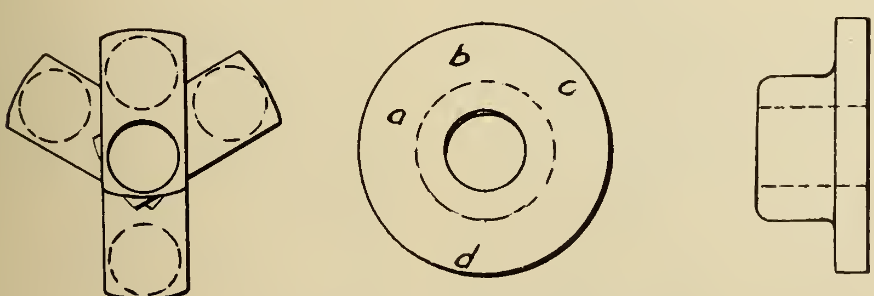


Fig. 2—Turning Four Throw Crank.

crank centres, a, b, c, d, were then laid out on the faces of the flanges and drilled and countersunk, as in Fig. 3.

The manipulation of the job when turning the pins was now very much simplified; for all that had to be done when changing from one pin to the other was to shift from one centre to the other on the discs.

All the pins could now be rough turned before any one was finished without causing extra expense in setting up the job.

This crank shaft had three equal crank throws for a three cylinder engine, and a fourth and shorter crank to be used for driving a small air compressor.

DRILL PRESS TURRET.

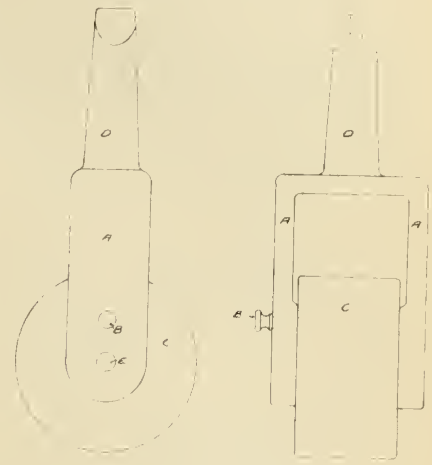
By A. E. D.

Herewith is a sketch showing the working of an efficient tool for drill press work. As yet it is not in very common use on a drill press, though turret lathes have long ago become an important machine tool in the factory.

The dimensions can be regulated to suit the class of work on the machine. The length of the arms A depend on the length of tool necessary for the work being done. B is shown in the sketch as a plug for locking the revolving turret C. This is much better when made with a spring arrangement so that there is no danger of it slipping from place. It is an easy matter to attach a lever with spring to hold it firmly in place. The seats in the turret C are bored exactly opposite the tools which are inserted in the drum C. Tools with taper shanks are usually used with taper sockets in C. Four tools is about the limit, though I have seen more used.

The workman operating must be very careful to keep his arms and clothes away from the turret, as it is rather a dangerous, though very efficient tool, if the machine hand is inclined to be careless. The shank D goes into the drill press socket the same as any collet. E is the axle on which the turret C revolves.

This turret is found to be a most useful tool where a job is to be drilled, faced and countersunk. Instead of handling a job three times, the drill press is stopped, the turret revolved and the work proceeded with without setting

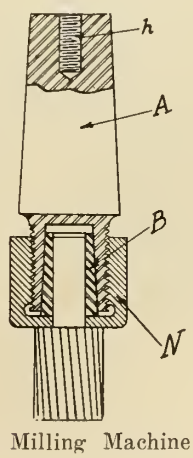


Drill Press Turret.

up the work again. The facing is then at right angles to the drilled hole and the counter-sinking is in direct line with the drilled hole. For certain classes of work this drill press turret will be found very useful and efficient.

VERTICAL MILLING MACHINE ARBOR.

The accompanying cut is of an arbor for a vertical milling machine which is



Vertical Milling Machine Arbor.

very simple in its construction, and, at the same time, very serviceable.

A is the shank fitted to the spindle of the milling machine and secured in the

same by a stud passing through the spindle and screwed into hole n.

B is a hardened steel split bush tapering on the outside to fit hole in shank A and parallel in the bore to fit shanks on cutters.

To insert the cutter slack off nut N and put in the cutter, tighten nut up securely thus forcing split bush B to grip shank of cutter.

JIG FOR FACING RAMS.

By J. H. R., Hamilton.

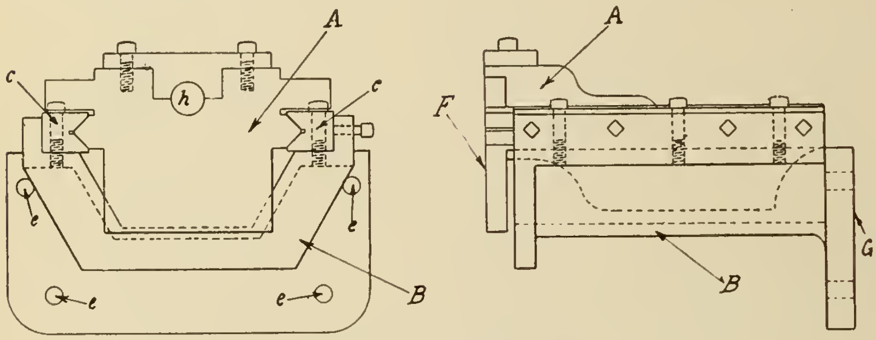
The accompanying illustration shows a very useful jig for boring and facing the ends of rams for power presses.

A, shows the ram placed in the jig ready for operation.

B, is the body of the jig planed on end G, and the ways for the gibs, c c, perfectly square with each other.

It is bolted to the faceplate of the lathe by the holes e, e, e, e, and adjusted to bring the hole h, in a central position.

Secure the ram firmly in position and it is ready to be faced and bored.



Jig for Facing Rams.

CUTTING SPEEDS OF THE NEW STEELS.

Robt. Grimshaw, Dresden, Germany.

The German Society of Engineers having requested the well known Prof. Hermann Fischer, of the Technical High School in Hanover to make a report upon the new "rapid-cutting" steels, he circularized the members of that society, with a view to getting an average opinion, based on actual experience, as to the proper cutting speeds on machine tools able to do the work that the tools would stand. The following figures show the speeds given by various members for roughing on lathes strong enough to stand up to the strain. The figures given in the professor's report are in meters per minute; I have changed them into feet per minute, as being more convenient to the readers of this periodical.—American Machinest.

Suggested by	Cast Iron Soft	Hard	Wrought Iron and Steel of 56,890—64,000 lb. per. sq. in. Tensile Str.	Steel of 85,340—99,560 lb. per sq. in. Tensile Str.	Steel Castings	
3	82.0—98.4	49.2—65.6	131.2—164.0	65.6—82.0	39.3—49.2	13.1—19.7 Nickel Steel
1	39.3—49.2	37.3—49.2	49.2— 59.1	26.2—32.8	39.3—49.2	
2	39.3—49.2	26.2—32.8	49.2— 59.1	32.8	39.3	
4	....	....	49.2— 59.1	39.3—49.2	....	27.9 for steel 99,560 to 11,380 lb. tensile str.
5	23.0	19.7	59.1	49.2	19.7—26.2	
6	....	....	....	75.4—39.4	....	
7	....	....	....	32.8—49.2	....	
15	39.4—45.9	39.4—45.9	39.4— 45.9	39.4—45.9	39.4—45.9	39.4—45.9
Average	49.2—65.6	39.3—49.2	65.6— 98.4	49.2—65.6	39.3—49.2	

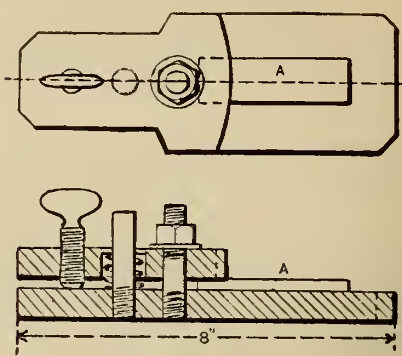
CUTTING SPEEDS OF ROUGHING LATHES—FEET PER MINUTE.

A USEFUL TOOL.

We have in our shop a useful little tool which goes by the name of the "liner-filer," as it is used for holding thin liners, washers, or other small articles when they have to be filed or faced up, and which, by reason of their thinness, cannot be held conveniently in the ordinary vice.

This liner-filer, or horizontal vice, as it might be termed, is of quite simple construction, and might with advantage be introduced into many fitting shops.

As will be seen from the annexed figure showing plan and section, it consists of an upper and a lower plate of $\frac{5}{8}$-in. iron, or steel for preference, the upper being smaller and not covering the whole of the lower plate or sole. In this sole are screwed two $\frac{1}{2}$-in. studs, one plain, the other being screwed at the top and fitted with a nut and washer; in the upper plate are three holes, two $\frac{1}{2}$-in. clear for the studs to pass through, the third tapped $\frac{1}{2}$-in. for a thumbscrew.



A Useful Tool.

When an article has to be filed, the smaller end of the sole is gripped in the ordinary vice, and a portion of the article, as shown at A in the figure, is placed between the plates and is clamped by running the nut down until it is just tight, the thumbscrew then being screwed down hard against the sole. In this way a powerful hold is obtained upon the article, which, resting on the uncovered part of the lower plate, may be filed or scraped without any fear of bending. When reduced to the proper thickness, it is turned round, the portion already filed is gripped, and the filing of the rest completed.

To keep the upper plate raised from the lower, a small spiral spring is placed over the plain stud, and fits up into the hole, which has been drilled for this purpose to a correspondingly greater diameter within about $\frac{1}{4}$-in. of the top, in the upper plate.—Mechanical World.

MEETING OF RAILWAY CLUB.

A very interesting and instructive paper was read before the Central Railway & Engineering Club of Canada on the evening of April 21, in Rossin House, Toronto, by Mr. A. C. Fleming Canadian Westinghouse Co., Hamilton, on "Illumination," and, as is often the case, in answer to questions and as a result of discussion, he afterwards gave valuable information on questions not touched on in the paper. The paper and the discussion had the good effect of impressing on the minds of all present the absolute necessity of proper illuminating of manufacturing plants to ensure accurate and quick work.

Mr. Jones, of the firm Jones & Glassco, Montreal, is on a business trip to England making arrangements to represent several English power and machinery lines in Canada.

POWER GENERATION AND APPLICATION

For Manufacturers. Cost and Efficiency Articles Rather Than Technical.
Steam Power Plants ; Hydro Electric Development ; Producer Gas, Etc.

GAS PRODUCER POWER PLANT OF DUFRESNE & LOCKE.

We have a very great respect for our friends in the leather trade, and when it is a question of manufacturing shoes, we readily admit that they know more about it than we do, but when it comes to power plants, we can hardly be expected to go to a shoe factory to find an example of up-to-date completeness in power equipment; yet any one who visits the establishment of Dufresne & Locke, shoe manufacturers, Ontario Street, Montreal, will assuredly give the proprietors credit for possessing an engineering instinct which often fails to show itself in the power end of a mechanical establishment.

Messrs. Dufresne & Locke utilize gas and steam power. For summer use their equipment consists of a Crossley gas engine of 50 h.p., running on producer gas, shown in Fig. 1; their acquaintance with this type of engine is not recent as they are one of the first, if not actually the first, firm in Canada to install a producer gas plant, having formerly a 20 h.p. Crossley engine in use, using producer gas not only for running the engine, but for various purposes in their shoe factory, in place of the five times as costly city gas.

Their present 50 h.p. plant has been running for nearly two years, and is successful in every respect. Even the Hydro-Electric Commissioners reluctantly were compelled to admit that this plant is "another example of a gas engine giving satisfaction." The engine is of substantial build, weighing something like 12 tons, and havng a heavy electric lighting type fly wheel, 8 ft. in diameter; the engine is provided with the Crossley patent breach end, by which the inner and outer shells are united in such a manner that contraction strains are avoided and fracture prevented. Ignition is supplied by a Simons, Bosch magneto.

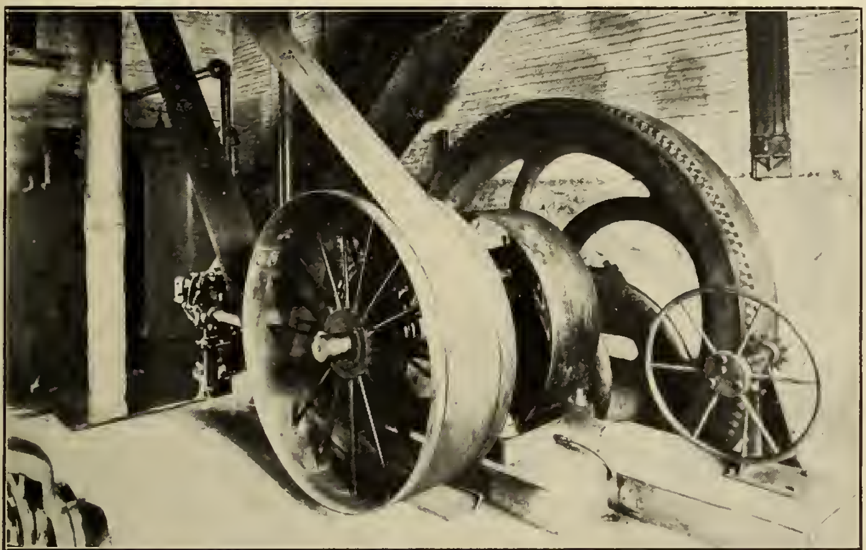


Fig. 1—Fifty Horsepower Producer Gas Plant and Crossley Engine.

The gas producer is not of the Crossley type, but was designed and built under the direction of Mr. Dufresne.

A direct current generator is operated by belt from countershaft in the engine room supplying all the electric light used in the factory.

For winter use this firm have recently installed a modern steam plant, Fig. 2. The steam engine is of English type; namely, the "Belliss," built by Messrs. Belliss & Morcom, Birmingham, England. It is of 125 b.h.p., and occupies a floor space of only thirty square feet.

The engine is provided with a system of forced lubrication, which by means of a small pump takes up the oil from the chamber below the crank, and forces it into the bearings under a 15-lb. pressure. The result is a noiseless running engine, with no oiling, or forgetting to oil, on the part of attendants. As will be seen in the illustration, the engine is compound.

Both the steam and the gas engine are belted to line shaft and both being provided with clutch couplings.

The exhaust steam from the steam engine is passed through a Laurie feed water heater, and then into the heating system of the factory, the steam header and pipes leading to the heating system being shown in Fig. 2.

The boiler is of the ordinary return tubular type, and was built by the Robb Engineering Company.

The complete power equipment was installed under the supervision of Messrs. Laurie & Lamb, consulting engineers, Montreal.

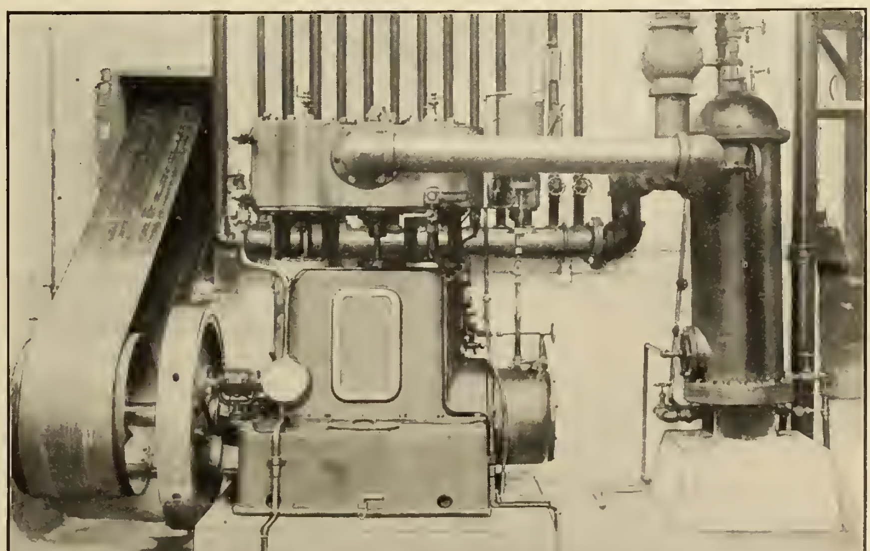


Fig. 2—Bellis and Morcom Engine and Laurie Heater.

Comments on Report of H.-E. Commission on Producer Gas*

The Columns of This Paper were Opened for Discussion of Report of the Hydro-Electric Commission on Producer Gas—Letters Received by the Editor.

To the Editor Canadian Machinery and Manufacturing News, 10 Front St. East, Toronto, Ont.:

Dear Sir,—We acknowledge receipt of your favor of the 2nd inst., inviting us to offer comment upon the report issued by the Hydro-Electric Power Commission of the Province of Ontario.

The purpose of this report seems to be to show a comparison between the cost of power as generated by producer gas plants and Hydro-Electric power.

The value of the report is almost destroyed by the fact that the examinations of producer gas engine plants made by the engineers of the Hydro-Electric Commission were based only upon "information supplied by the firms using the plants."

It is very obvious that the data given is unreliable, for the reason that no actual tests were made, and as the report says, "No attempt has been made to check this information."

Every engineer must concede that accurate data covering the performance of any prime mover has got to be based upon thorough and accurate tests. Notwithstanding, however, the fact that no tests were made at all, the report undertakes to give the cost per horse-power hour in cents and fractions of a cent!

Out of "twenty-eight producer gas plants visited by the Commissioners' engineers" only five are marked on the tabulated sheet as "failures"—the inference being that the remainder of the plants (or 82 per cent.) are operating successfully, although the report does not so state.

Considering the report as a whole, it is a mixture of endorsement and condemnation of gas engine plants. The report admits that the failures visited were due either to inexperience or bad judgment on the part of the builder or the purchaser (see pages 23 and 24), and says "almost every case of unsatisfactory service can be traced to a failure to observe one or the other of these causes."

The very next paragraph says a "power user to-day would not be justified in investing in a producer gas plant unless the estimated saving in the total cost of power was sufficient to compensate him for an unreliable service," and yet again the report gives (pages 97, 98, 99 and 100) a most unqualified endorsement of reliability of operation in twenty-one out of twenty-five examinations made. The following extracts for example.

(1) "This plant has been in operation for nine months for power and lighting, and is highly recommended by the user."

(2) "This plant has been in use for four and one-half years and gives reliable service."

(3 "This plant, which was installed in the basement of a building, has been in use for one year and gives reliable service."

(4) "Two engines directly connected to electric generators, which run practically the whole year round with practically a steady load."

(5) "This installation used for electric power and heating in sheet metal works has been in successful operation for fifteen months."

(6) "The plant has been in use for three years and is giving reliable service. This plant is also installed in a dark and inferior position in the basement."

(7) "One thousand horse-power, generating electric power and light, giving reliable service, and has been in use for three years."

(8) "This is a suction gas producer plant for electric power and light, installed in basement of a factory building, has been in use for one year, giving reliable service, and seems to be a model plant giving every satisfaction."

(9) "Suction gas plant for electric power and light, installed in a machine shop—plant in use for sixteen months, giving reliable service and is a model plant."

(10) "It has been in use four and a half years and gives reliable service."

(11) "This is a new installation which has been in service for only four months and has given satisfaction since the start."

(12) "This is one of the oldest plants on the continent, having eight engines of various capacities and makes. The plant is used principally for lighting a terminal railway station. In this case the fullest reliability is necessary, still there are no spare engines, the plant being worked at full capacity during the night. The plant which has been in operation for nine years was enlarged two years ago—and shut-downs seem to be an unknown quantity.

(13) "A well installed and operated suction producer plant driving a machine shop. The plant gives reliable service and is highly recommended by the user. Has been in operation for two years for power and lighting."

(14) "This suction gas plant has been in operation for nine months for supplying power to an air compressor and a small electric generator. There has been no interruption in the service, and it is giving the user full satisfaction."

(15) "A well installed and carefully operated suction producer plant, operating air compressors and electric generator. The service has been reliable."

Etc., etc.

In the summary (page 101) the report says: "Producer gas cannot be declared a complete success, because many plants do not give satisfaction and are unreliable and expensive to operate."

My answer to this remark is that the development of every great utility has been marked by a series of failures. The path which leads to success must be fraught with failure. The principle applies to every phase of life and gas engines, above all else, have been developed to a commercial success through the world-famed persistency which characterizes the British engine builder—and which, for that matter, characterizes the Britisher in all his undertakings.

The Ontario Government has committed itself to a Hydro-Electric power enterprise: has represented to the people that it is the cheapest power in the world: that its transmission throughout Ontario should make that Province a great manufacturing centre, and heralded the wonderfully low cost of "$10.40 per annum per horse-power at the Falls." Ten dollars and forty cents per annum per horse-power at the Falls does seem like exceedingly cheap power; but with the water-wheel loss of 20 per cent., the generator loss of 10 per cent., over all transmission losses of say another 15 per cent., step-down losses and finally the 20 per cent. to 25 per cent. motor loss at the point where the consumer would use it, it brings the cost of Hydro-Electric power up to a point on the line shaft of the consumer where it cannot begin to compare with the cost of a like amount of power produced for that same consumer by a gas engine.

Looked at from a municipal point of view—a municipality constituting itself the purchaser of a stated amount of power from the Hydro-Electric Commission—the municipality must take the power from the Hydro-Electric Com-

* This report was synopsized in the April issue of Canadian Machinery; or a printed report may be obtained from the Hydro-Electric Commission, Continental Life Building, Toronto.

mission at its city limits, and then it must distribute this power for consumption by its citizens. To do this at a price which will insure against a deficit, they must charge the individual consumer a rate which, compared with gas engines, would be prohibitive.

Furthermore, the much mooted point that it is 24-hour power that they are giving the consumer is not only irrelevant by virtue of the fact that not one consumer in a thousand has need for 24-hour power, but must be eliminated from the consideration, because the requirement of nearly every consumer of current (either light or power) is on from a 10-hour to a 4-hour basis. Domestic lighting will not average 4 hours; street lighting will not average 10 hours, and manufacturers' requirements are practically universally on a 10-hour basis.

I have demonstrated in a number of public addresses delivered in Ontario, that Toronto, London, Stratford or any of the other principal towns, could not sell this current to the individual consumers for a price less than the equivalent of $50 to $60 per annum per horse-power.

Our people have built and installed many thousands of producer gas plants in practically every country in the world: we know with certainty what we can do and we know beyond all peradventure of doubt that we can put a producer gas plant in for the individual consumer which will deliver power on his line shaft for approximately half the price which the municipalities should charge the manufacturer—if they expect to avoid a deficit. We can establish the reliability of operation beyond all question. We hold the record for a 5½-month run, without a moment's shutdown, for one engine. In other words, we are prepared to make the manufacturer or the user of lighting current in any quantity, a proposition against which Hydro-Electric power as proposed by the Ontario Commission cannot compete.

We look upon the report as a strong endorsement of the success of gas engines.

Faithfully yours,

COLONIAL ENGINEERING COMPANY, LTD.,

L. G. Read, Managing Director and Chief Engineer.

* * *

To the Editor Canadian Machinery and Manufacturing News, 10 Front St. East, Toronto, Ont.:

Dear Sir,—The April number of your esteemed paper gives a summary of a report on producer gas power plants by the Hydro-Electric Commission, in which it is stated that such a type of plant should be selected and installed under the supervision of a competent person and a trained man then put in charge of it.

Would you kindly let me know of any mechanical plant for power, be it steam power, electric power or even water power, that could be installed by an incompetent person and run by a man not familiar with or properly trained for such work?

The same note admits that one should go to European countries to find reliable gas plants and states that the selling agents in Canada should stop "preaching the pound of coal per horsepower hour sermon."

Perhaps I may be able to throw some light on this subject by the few remarks following:

Several producer gas plants have been installed in Montreal within the last five years, for shop work and for electric lighting. One of the daring manufacturers who started out in this venturesome line (as the Hydro-Electric Commission would have us believe), and installed a producer gas plant in his factory, has since erected another and a far bigger one in the same factory.

Another firm in the same city, after installing a first one four years ago, ordered a second one three years since, and has still ordered another one within the last year, and has it now running.

A large religious community in the city again had a gas plant erected in one of their colleges near here, five years ago; three years ago they ordered a producer gas plant for electric lighting in another of their colleges in the city proper. Last year they actually put in another producer plant in their printing office in the city, and at this time of writing have just decided to take another and a fourth one for another of their colleges."

One wonders whether these people are bothering themselves with the "pound of coal per h.p.h."? None of them had any actual test of consumption made, it is true; but the first one mentioned was running at an expense of $4 a week with his former gas plant, whereas it used to cost him $15 a week with his steam plant. The second one is now running at a cost of $800 a year for power and electric lighting, whereas it used to pay $3,000 a year for the same thing, or less, in former years. The third firm mentioned now pays $14 a month where they used to spend $100 before.

And all these people are sufficiently well satisfied with such results as these, without bothering about actual consumption tests for consumption of coal per h.p.h. which, as a matter of fact, would mean nothing or next to nothing for them in any case.

Putting the matter frankly, is it really to be supposed that a concern like the Kingsbury Footwear Company, using over 100 horse-power in its factory, would triplicate an order for plants which it considered non-reliable? Is it likely that a large college, after running for years with light made from one of these plants, would continue doing so and install more of them, if they considered the plants unreliable? And so on, for many other instances which could be mentioned.

And again, what are the manufacturers saying who formerly used electric power for their plants? They state that when they were running on electric power, they were stopped at least 48 hours per annum for lack of current, while now they are never bothered with stoppages and sometimes run their plants for 15 hours a day.

Another which your correspondent says is that when agents for producer gas plants are preaching the economy of gas power, all they have to refer to are tests made in England, three thousand miles away. Now neither Montreal nor Quebec are thousands of miles away from Toronto, but, nevertheless, when an Ontario manufacturer asking for particulars of a gas producer plant is referred to plants in Montreal, his reply is to the effect that he would like to know where he could see a plant running in Ontario. Montreal is of no consequence to them.

Whenever some of these manufacturers finally decide to come and see some of the plants referred to and satisfy themselves by actual inspection of their efficiency and reliability, their first care is to give their order to some party who had nothing to do with the construction of the plant they inspected, and who is anxious to sell his first plant at any cost, if he loses on it. For the sake of an economy of a few dollars, they buy the wrong plant, instead of the good one they saw or something like it.

Others, for the sake of saving the fees of a competent engineer or agent, will order their plant from some builder in England or in the United States and will get what they deserve again, viz., the wrong kind of plant for the coals they have at their disposal, or some defect in the installation.

Then there is again another class of manufacturer, who richly deserve the troubles they incur with their gas plants; they are those who know more about the business than all the engineers, builders or agents put together. When told that certain oils are not the proper kind to be used on a gas engine cylinder, they say they are first-class; when told that the size of coal they are using is not the one required for the producer they have, they keep on using the same article; when told to screen the coal, they reply it is screened enough as it is by the dealer. Others claim to

be acquainted with parties who know all about gas plants; they retouch and alter everything to suit themselves or the fancy or their friends. In fact, it is sufficient that an agent and competent party should advise them to do anything, for them to do the very reverse.

And these are the very men who are the greatest detractors of gas plants. It may come as a surprise to most people, indeed, but it is nevertheless a fact that a producer gas plant must be designed for and adapted to the kind of coal which is to be used in it; it must be erected under the superintendence of a competent gas engineer and it must be put in charge of an intelligent man to run it. There is no fancy work to be done in the running of such plants; it must be done according to certain rules, which must be followed out strictly as indicated by the builder.

Naturally, such men as those cited above should have stuck to electric power, at whatever cost to themselves.

The only parties who are satisfied with gas plants, you may rest assured, are those who, after visiting plants that have been running satisfactorily for years and saving thousands of dollars for their owners, have inquired who erected and designed the plants and then went to the same parties to have design their plants, notwithstanding the somewhat lower prices or fanciful guarantees given by beginners, who are anxious to sell their first plant at any price and will take long chances on it.

None of these men have bothered about so-called consumption of coal per h.p.h. Such consumption could scarcely be the same with coal containing 20 per cent. ash, as some of our coals do, as with Welsh coal containing only 4 per cent. All they have bothered about is that they are satisfied with the simple remark that the cost of their plant is saved in some three years, by the mere economy effected in fuel, as compared to any other kind of plant, natural gas at 20 per cent. and direct water power alone excepted.

The cost price of producer gas power has been proved by actual practical test covering a number of years in the City of Montreal, to compare favorably with electric power at $14 per h.p. per annum and with steam power using coal at $0.60 per ton.

If that is not a pound of coal per h.p. per hour, it is something so much like it that the difference is not worth talking about.

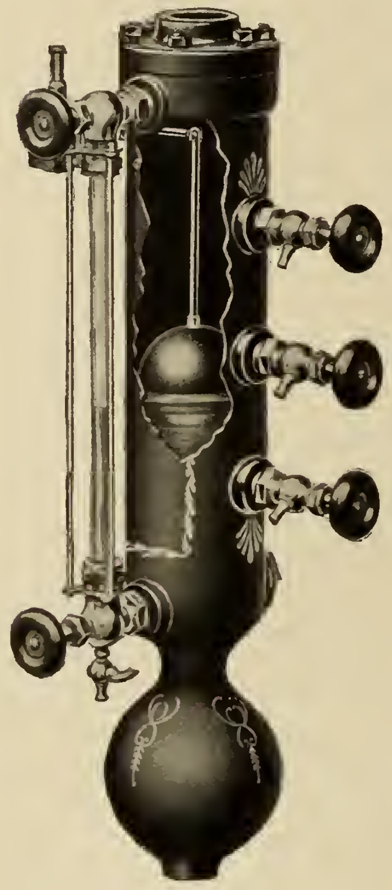
J. DE CLERCY C.E.,
62 Ontario St. West, Montreal.

[We have several other letters, which, owing to lack of space in this issue, will have to be held over until our next issue. —Editor.]

AN AUTOMATIC BOILER FEED.

The accompanying illustration is of a new automatic boiler feeding device which the makers, Nash Thermostats Limited, have on exhibit at their offices, 39 Richmond Street east, Toronto. It has already been installed in several power plant and is giving every satisfaction.

The operation of the apparatus is very simple. The float operates a needle valve which controls the air supply in a small



New Boiler Feed Device.

pipe. This air pipe leads to a rubber diaphragm, which operates the valve in the water pipe leading to the boiler. Thus, when the level of the water in the boiler drops, it drops correspondingly in the control chamber. This lowers the float which operates the needle valve in the air pipe, allowing the air pressure to operate the valve in the water pipe by means of the rubber diaphragm. Thus the water level in the boiler is maintained constant automatically.

BUILDERS' SHOW MONTREAL.

The Builders' Exhibition, held in the new Coliseum, April 20—25, has been most successful, and was daily visited by many interested in the building and allied trades. The booths were tastefully decorated and well arranged.

Francis Hyde & Co., 31 Wellington St., had a display of their various lines of fire brick builders' supplies, wheelbarrows, etc. All were shown to good advantage in a large booth in the centre of the building.

The Hill Electric Switch Co. had a good display of their type "D" electric switches and time clocks for throwing off lights at any hour.

The Canadian Asbestos Co. showed a complete line of asbestos packing in sheet and rope form, gaskets, leather-bound belting and pipe coverings. E. F. Dartnell displayed cement filler for power houses making cement floors waterproof and dustless, and damp-resisting paints for iron and steel work. Robt. Mitchell had a fine display of plumbers' supplies, including the Nethery flush valve.

Lockerby & McComb had a roof felt exhibit, the Pedlar people displayed roofing and expanded metal, Hyde & Webster, firebrick and cement; Warden King, furnaces and plumbing supplies; Messrs. Gurney, Massey & Co., furnaces and plumbing supplies; The Special Machinery Co., typewriters; and Dominion Radiator Co. exhibited stoves and furnaces. Other exhibitors included Terra Cotta Co., Laprairie Brick Co., Frank Ramsey, Armstrong, Cook Co., etc.

SEMI-ANNUAL MEETING OF A.S.M.E.

The semi-annual meeting of the American Society of Mechanical Engineers will be held in Detroit Michigan, June 23—26. Among the papers to be presented at this session are: "A Method of Cleaning Gas Conduits," by W. D. Mount; "A Method of Checking Conical Pistons for Stress," by Prof. George H. Shepard; "Clutches" with special reference to automobile clutches, by H. Souther; "Horse-Power, Friction Losses and Efficiencies of Gas and Oil Engines," by Prof. L. S. Marks; "Some Pitot Tube Studies," by Prof. W. D. Gregory; "The Thermal Properties of Superheated Steam," by Prof. R. C. H Heck; "A Journal Friction Measuring Machine," by Henry Hess; "A By-Product Coke Oven," by W. H. Blauvelt; "Tests of Some High-Speed Steam Engines," by F. W. Dean. There will be a symposium upon machinery for conveying materials, with papers by several authorities. The Society for the Promotion of Engineering Education and the Society of Automobile Engineers will also hold their annual meeting in Detroit at this time, which will enable members of each society to participate in the sessions of the other.

DEVELOPMENTS IN MACHINERY

New Machinery for Machine Shop, Foundry, Pattern Shop, Planing Mill; New Engines, Boilers, Electrical Machinery, Transmission Devices.

IMPROVED MOTOR DRIVEN CAR WHEEL BORING MILL.

The illustration shows a late type of motor driven car wheel boring mill with improved automatic chuck, friction feed, disks and crane attachment.

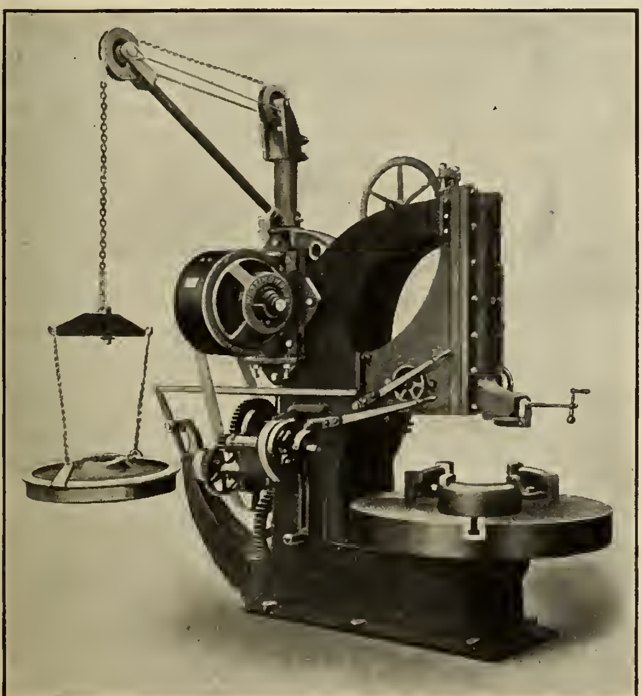
It is a 54-inch machine and its heavy construction and powerful gearing renders it capable of taking the heaviest cuts required for this class of work.

The automatic chuck is self-closing, self-opening and self-centering. It has three adjustable abutments, each provided with an equalizing steel jaw with two bearing points. The work is thus held and centred by six points on the circumference, insuring accuracy in centering.

The first movement of the driving shaft causes the jaws to close in upon the work, after which the motion is transmitted to the table to produce rotation. When the work is completed, the chuck is released by disengaging the driving clutch and retarding the driving shaft by means of the friction brake provided for the purpose. The inertia of the table and work thus imparts the necessary force to open the jaws.

The work is secured in its correct position in the machine and released with no loss of time and without labor. Since the power of the clutch grip increases with the resistance of the cut, it is never necessary to stop the table to tighten the chuck.

The boring mill is especially arranged for electric drive, and the motor is mounted on the vertical housing of the frame. The motor is a Westinghouse type "S" for a variation in speed of approximately two to one, and therefore eliminates the cone pulley required by line shaft drive. This increases the machine capacity because the variable speed motor gives the desired range of speed in much smaller steps, permitting the mill to be run at all times at its maximum. The mill is manufactured by William Sellers & Company, Incorporated. Philadelphia.



Fifty-four Inch Car Wheel Boring Mill Driven by 7½ h.p. Westinghouse Motor.

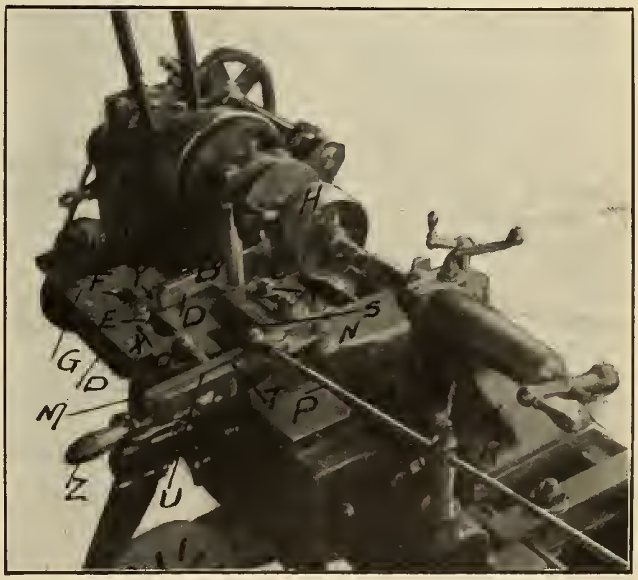
A FORMER ATTACHMENT FOR LATHES.

This attachment is for producing formed work such as crowning pulleys. The design is such that in crowning pulleys only one former is required to produce different degrees of crown.

The attachment is secured by two bolts a a to the tool post slide of the lathe. The tool post b with its tool c is carried at the left of the carriage on a slide d which is movable to and from the axis of the lathe. To the slide d a roll e is secured which enters a formed slot f whereby it is engaged by the slide g in which the slot is formed. If the slide g remains stationary and the tool c travels as in turning the pulley h, the roll e will follow the slot f and impart to the tool c a movement corresponding to the form of the groove f. The path of travel of the tool may be modified by moving the slide g concurrently with the travel of the tool c.

If the slide g be moved in the same direction as the tool c then the crown cut by the latter will be flatter, or of less curvature than when the slide g is stationary and the roll e simply follows the form f. If, on the other hand, the slide g moves in a direction opposite to that of the tool c then the latter will cut a crown that is ranker, or of greater curvature than when the slide g remains stationary. This difference in degree of crown is secured by means of the radius bar m, secured to the fixture at n, and connected with the slide g by the link o. It is also connected by a tie bar p with some stationary element as the bracket r secured to the ways of the lathe.

It is preferable to secure the bracket r to the tailstock, permanently, where it can usually remain when the attachment is not in use, without interference with other work. The radius bar m is T-slotted and in the slot is a slidable T-bolt s by which the tie bar p is connected. When the tie bar is secured, as shown in the photograph, by the T-bolt s which is the fulcrum of the radius bar, the lathe carriage and tool moving in the direction



A Former Attachment for Lathes.

indicated by the arrow x will cause the slide g to move in the opposite direction indicated by the arrow y. This causes the tool to cut or turn an abrupt crown.

Were the tie bar secured at t just at the connecting point of the link o, then there would be no movement of the slide g, and the tool c would cut a crown, the counterpart of the formed slot f. Were the tie bar p secured to the radius bar m at u then the slide g would move in the direction of the arrow and cause the tool c to produce a crown flatter than the crown of the formed slot f.

With this device, special arbors are not necessary. The pulley to be crowned can be located anywhere on its arbor. On very abrupt curves the former is made to travel faster. In this way curves can be produced which could not be made with a stationary former.

This attachment is made by the Mossberg Wrench Company, Central Falls, Rhode Island.

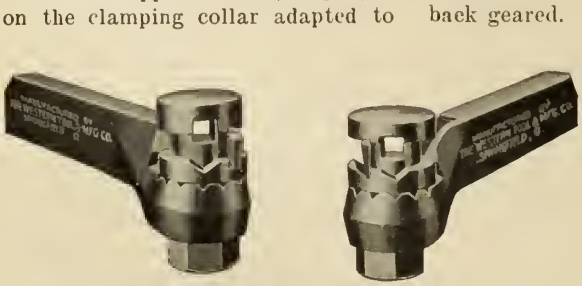
NEW COMBINATION TOOL HOLDER

The Western Tool & Mfg. Co., of Springfield, Ohio, have recently put on the market a combination tool-holder having seventeen tools in one. This toolholder comprises a shank, the head having its upper and lower surfaces depressed to a level lower than that occupied by the upper and lower surfaces, respectively, of the shank. The shank has a longitudinal recess therein, adjacent to the head, adapted to receive the end of the cutter, and a clamping bolt carried by the head.

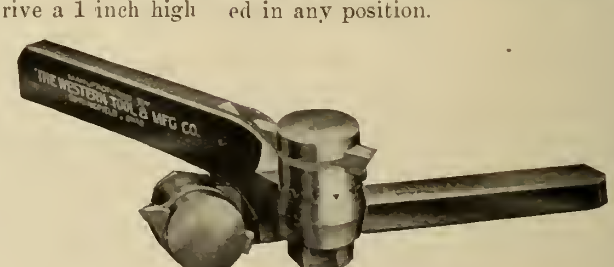
This toolholder has a clamping collar adapted to be supported by the head, having a transverse recess therein, a clamping bolt adapted to extend through the collar and the head provided with an enlarged head having a recess in the lower surface thereof at one side of the bolt extending transversely thereof and adapted to co-operate with the recess in the collar.

This toolholder has a plurality of notches in the upper surface, and the clamping collar has also a plurality of recesses in the upper surface, a projection on the clamping collar adapted to engage one of the notches, a clamping bolt adapted to extend through the clamping collar of the head and provided with an enlarged head having a plurality of recesses in the lower surface and adapted to co-operate with the recesses in the clamping collar.

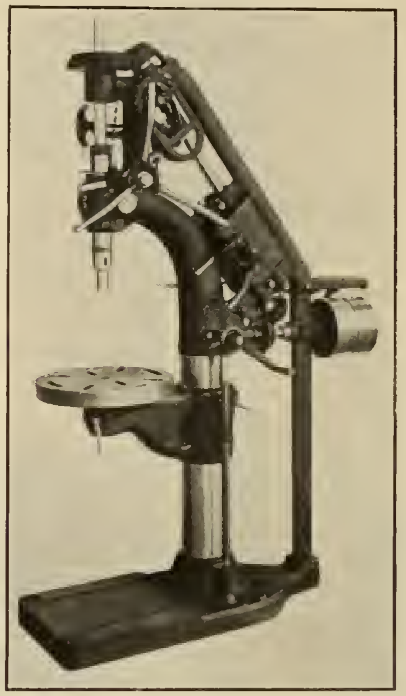
With the use of two collars having recesses, provision is made for straight right and left turning tools, side tools, cutting-off tools, boring tools, threading tools and the key-seating tool, all in one. This tool is sold by the manufacturer either as a single tool, such as the dropped head planer, cutting-off tool, side tool or key-seating tool, or as a total combination. The accompanying illustrations shows some of the applications of the holder.



New Combination Tool Holder.



New Combination Tool Holder.



New Design Upright Drill.

NEW DESIGN UPRIGHT DRILL.

The accompanying illustration is of a 20-inch upright drill of original design, the result of 25 years' experience in drill making. The particular features of the drill are the frame construction, the geared speed changes and positive power feeds. It is designed to handle twist drills up to 1 inch in steel without back gears, or to $1\frac{1}{2}$ inches in steel when back geared. It will drive a 1 inch high speed twist drill, running at 190 revolutions per minute, continuously, at a feed of 2 inches per minute in steel and 3 inches per minute in cast iron, without back gears. The operator standing in front of drill is within reach of all change levers.

The back brace on the drill makes a rigid construction.

The spindle is made of the best quality of machinery steel, double splined and ground to size; fitted with a special ball thrust bearing of great strength. The spindle is counterbalanced, and nose is extended to bring drift hole below sleeve.

The gears for changing the speeds are located on the diagonal shaft, as shown in illustration. There are four changes of speed, without back gears, any one of which is easily and quickly obtained without stopping the drill, simply by operating the proper shifting lever.

The back gears are operated by a small lever accessible from the front of the drill, and, by means of these gears, eight changes of speed can be obtained; sufficient for all twist drills from one-fourth inch up to two inches.

The feeds are positive and any feed from .001 inch up to .025 inch may be instantly secured while the drill is in motion by means of the small index lever directly in front of the operator. The controlling mechanism for the feed changes is entirely new, but so practical and convenient that it adds much to the utility of this drill. Automatic stop is also furnished.

The hand feed is operated by means of a star wheel lever, entirely different from anything before used. It operates through a pinion running into an internal gear, the latter being mounted on the cross spindle; thus the star wheel handles are equivalent to a common lever of four times their length. This star wheel also acts as a quick return lever, eliminating the use of a ball handle for the purpose.

The machine is regularly supplied with the round table as in illustration, but when required a square table with oil channel can be supplied instead. The table is raised and lowered with a crank operating through mitre gears and screw, as shown, and the table can be swung around on the column and clamped in any position.

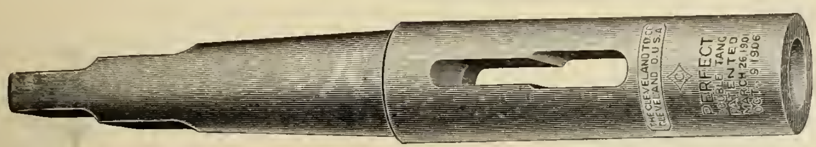
For tapping reversing friction pulleys are put on in place of the tight and loose pulleys, which make this geared drill just as good for tapping purposes as an expensive geared tapping attachment.

This drill is supplied with motor drive if required.

The drill is made by the Barnes Drill Co., Rockford, Ill.

DOUBLE TANG SOCKET.

The double tang socket, shown in the accompanying illustration, is an entirely new socket idea, one that is free



Double Tang Socket.

from the complications and high prices that have characterized all former attempts to end taper shank tang troubles. These are made by Cleveland Twist Drill Co.

These double tang sockets serve two purposes, both of great importance to all shops: (1) They hold taper shank tools so that the tangs cannot twist off: (2) Old tools with tangs broken off can be ground or milled with new tangs to fit these sockets and will give longer service than with their original tangs.

This is an economy that has been sought for ever since the taper shank came into use. Previous attempts at improved sockets have been complicated and high-priced. The double tang is both simple and inexpensive. It has no parts to get out of order or to wear out, and fits any spindle having a regular taper hole.

Any taper shank tool can be easily fitted to the ''Perfect'' socket, as it is designated, by grinding or milling a second tang below the original tang. This second and stronger tang fits into the secondary opening of the ''Perfect'' socket. The shank is thus held by two tangs that cannot be twisted off under the severest strains.

Every shop has somewhere an accumulation of drills that would still be good and serviceable if their tangs had not twisted off. With this socket is a chance to use these.

A PORTABLE BORING MACHINE.

The accompanying illustrations are of a patented portable drill, made by the Scott Machine Co., London, Ont., for boring in all classes of material, above or below water. It is intended for dredging bridge piers, pipe laying and similar work, and also for light well digging. Fig. 1 shows the machine packed up ready for transportation, and Fig. 2 shows it erected and in working condition.

Some of the features of this machine

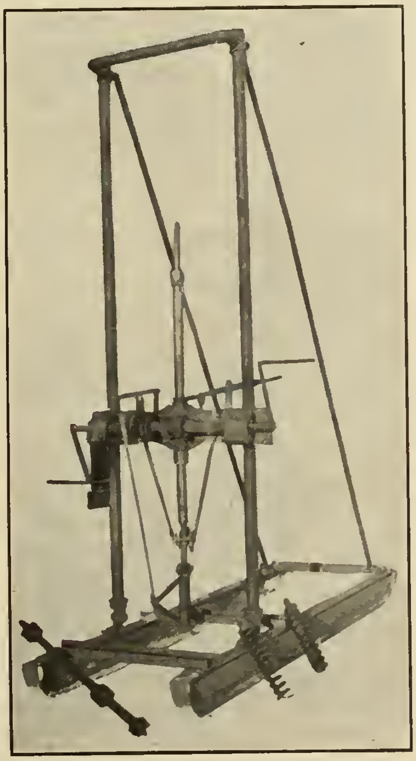


Fig. 2—Boring Machine Erected.

are: Feeds automatically, not positively; is adapted for very general use; is portable, simple, and is easily handled; the long pitch of the feed-screw (cylinder M, Fig. 2) takes up the motion of raft or boat and keeps up a pressure on the boring tool; it is equipped with loots for working in clay, cylinder pump for quicksand, mud or slime; screw auger for use in hard clays with a hollow cylinder down its centre to prevent vacuum; a plain ship auger for extracting indurated clays through a dry cylinder, a hollow cylindrical auger for sand, a steel rock drill, a reamer (fluted round), clamps for clamping to standards for platform in case of necessity; the drill rod connecting joints

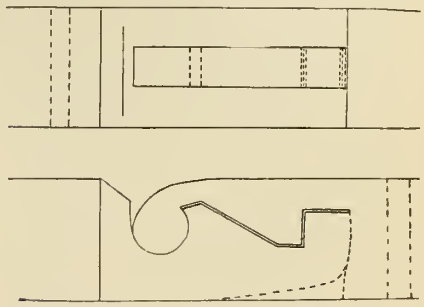


Fig. 3.—Drill Rod Connecting Joint.

shown in Fig. 3, which is a patented joint impossible to disconnect when the drill is in operating position.

The I.C.R. are using several of these machines. The inventors are: H. J. Lamb, C.E., Department of Public Works, Ottawa, and A. K. Kirkpatrick, C. E.

Fig. 1—A Portable Boring Machine.

DIE EQUIPMENT OF NEW STAYBOLT CUTTER.

One of the most important of the novel features of the new staybolt cutter recently placed on the market by the Landis Machine Company, Waynesboro, Pa., is its die equipment. The patent dies, although the same as used on other Landis bolt threading machines, are very different from those used on other staybolt machines. The chasers are each 4 in. long, and have threads milled on the flat side running the full length of the chasers, as shown in the accompanying illustration. These chasers are set tangent to the rod being threaded, which gives the correct cutting clearance. The

rake can be ground to any angle desired to suit the kind of material being cut, and a rolling chip can be taken, as with a lathe tool, consequently the highest possible speed in thread cutting can be employed and the best results obtained. All chasers are perfectly interchangeable.

The fact that no lead screw is required to govern the pitch of the rod being threaded makes this die especially valuable in cutting staybolts. The chasers are not hobbed, but are milled, and are held in such a manner that the front or working teeth will do the cutting at all times, while the back teeth can do no cutting at all, but extend across the cutting line, and thus the four chasers form a lead nut, which bears on the threaded rod and draws it into the cutting teeth, true to the pitch of the die. This lead is so positive that it is claimed to be impossible to alter the pitch of the thread by retarding or forcing the rod into the die; the only effect would be either to strip the threads off the rod entirely, or to pull the teeth off the die. The lead

Die Equipment of New Staybolt Cutter.

remains constant always, since the die never needs to be ground in the throat; all grinding is done on the ends of the chasers, which gives them a uniform shape, and each grinding renews the leading qualities as well as the cutting ability of the dies.

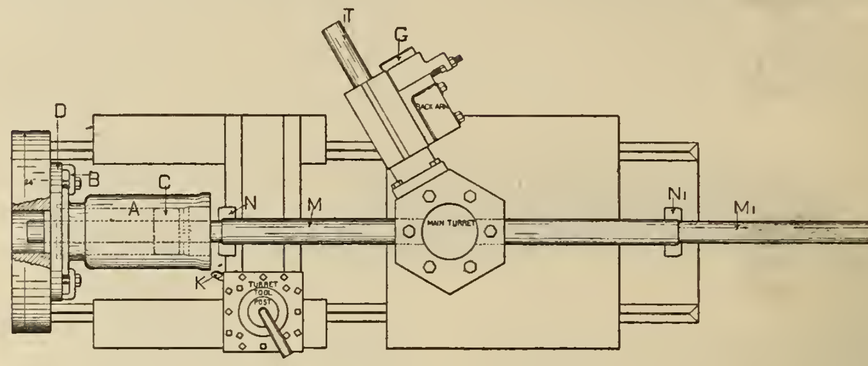
Accuracy of pitch on work cut in machines using lead screws is doubly difficult to obtain, since it depends upon exact agreement between the leads of the dies and the screw, and both have to be hardened with a risk of suffering change of pitch. The best lead screw made must be cut with some form of die or on an engine lathe where accuracy cannot be guaranteed. With the Landis die there is only one hardening to contend with, that of the die itself, and in making these dies the shrinkage of the metal that may occur in hardening is taken into consideration, so that the inaccuracy of this die is minimized. When the dies and the lead screws in machines using the latter are not exactly of the same pitch, a bad and distorted thread will be produced, because the lead screw will work against the dies, and the lead screw nut being the most powerful, the die is bound to distort the thread, making it ragged and frequently pulling off the tops of the threads, as all of the teeth of a hobbed die can shave the thread. The die in the Landis machine, it is claimed, never requires to be annealed, hobbed or retempered, consequently is not subject to the changes which are liable in rehobbing dies. The life of the die is also claimed to be greater than that of any other, and to have a much wider range on special diameters.

MACHINING ENGINE CYLINDERS.

The following is the method of machining engine cylinders used on Gisholt lathe, shown also in two accompanying figures :

The piece is centred and held by the chuck jaws "B;" at its outer end it is further supported by the set screws "E" in the chuck bonnet "D." This bonnet is shown bolted to the chuck and has slots to allow the chuck jaws "B" to be moved in and out as necessary. While rough-boring the hole with the cutter "N" in boring bar "M," which is supported in the chuck bushing "R," the scale is broken on the end of the piece, with the tool post tool "K."

The boring bar "M-1" is used for finish boring, being supported in the bushing "R" the same as bar "M." The hole is then brought to size with the floating reamer "Q." Some users consider it better practice to ream on the second operation, allowing the piece a chance to cool, though the design of the piece would largely determine this.

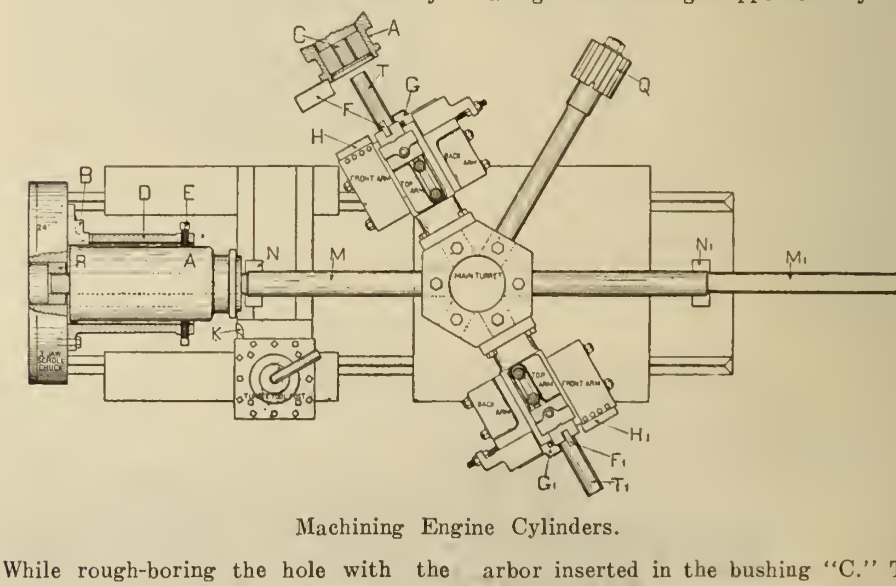


Machining Engine Cylinders.

For finishing the end of the cylinder and the counterbore the cutters "F," "G" and "H" in the facing head are used, these heads being supported by the arbor "T" inserted in the bushing "C" in the finished hole.

In the second operation the piece is clamped by the clamps "B" to the chuck plate "D" which is bolted to the face of the chuck; the piece being centred by a counterbore in the chuck plate the same size as the hole in the crank case.

The bushing "C" is inserted in the piece for supporting the boring bars "M" and "M-1" and the counterbore is finished with the cutters "N" and "N-1" shown in the boring bars. The end of the piece is roughed off with the tool post tool "K" and is finished with the cutter "G" in the facing head being supported by the arbor inserted in the bushing "C." The cutter "G" is a serrated cutter giving a rough face to end of cylinder for holding the packing.



Machining Engine Cylinders.

If it is desired to ream the piece on the second operation, the reaming would be done after finishing the counterbore.

FOUNDRY PRACTICE AND EQUIPMENT

Practical Articles for Canadian Foundrymen and Pattern Makers, and News of Foundrymen's and Allied Associations. Contributions Invited.

METAL MARKETS.

The metal markets have been irregular during the month, due to the poorness of the demand, and the speculative influences that have been at work. At one period it looked as if the anticipated turn in the tide had commenced. Copper strengthened under an optimistic feeling abroad that a complete revival of business in the States was near at hand. London quotations advanced, and as this market at the present moment sways New York, Wall Street quotations advanced likewise. Tin, under a remarkable bulling movement in England, and a continuance of the spot scarcity in the States, strengthened in price, while lead also took a turn for the better. But the long-wished for improvement in the demand did not come, and the markets, with the exception of tin, have fallen away again. Even the smaller consumers who were purchasing more freely are fighting shy once more. Comparing conditions with a month ago, copper may be considered a little weaker. Spelter weaker, lead about the same, and tin somewhat stronger. Pig iron has proved the most reliable of all the metals.

Copper, as we have said, is weaker, and Canadian quotations which were from 14¼c to 14½c are now 14c with shading for large lots. The demand continues slow, but inquiries appear to be a little more promising. It is interesting to note with regard to copper production, that, despite the poor demand all the principal mines are active, and that the Granby mines had record-breaking weeks in March, and have been shipping at an average of 3 755 tons daily. The tonnage for March, for the first time in the history of the Granby mines, or in that of any other copper property in the Dominion, exceeded 100,000 tons.

The tin situation is not a strong one. The great bulling movement in London has been maintained in wonderful fashion, considering the dull consuming conditions obtaining, but there is always this danger that the bulls may give way at any moment and a heavy unloading of metal break prices. The tin plate companies in the States are buying more freely now, which is a promising sign, but outside this demand, the call is a comparatively poor one. Locally, prices advanced with the manipulation in the primary markets, but with the recent sign of weakness appearing, quotations in Canada have fallen back to the price quoted last month, i.e., $34. The demand is on the slow side.

The English and Scotch pig iron markets are maintaining strength in splendid fashion, and with low stocks and a strong demand, especially from Germany, prices have kept firm with an upward tendency. In the States, conditions are not so satisfactory. Little business is doing except at prices below the published ones. The steel manufacturers announce their determination to maintain prices, although many pig iron producers complain that this attitude is not helping to improve the situation. Some good Canadian orders have been placed in the Old Country for the opening of the St. Lawrence. Prices, ex-store, remain firm with fair business doing.

Lead made a steady advance during the opening weeks of the month, and prospects seemed favorable for a strong rally in the English markets. The demand improved, and with producers curtailing their output, a strengthening tone was given to the markets which advanced figures across the Atlantic and in Canada. But the markets have now fallen away again. Manufacturers generally do not seem inclined to replenish stocks until the market for the finished article improves, and lead is now quoted here around $4 for imported pig, the same price obtaining at the opening of the month.

Spelter has been holding pretty firmly under a fair demand, but the market, apparently, has been kept back by second-hand offerings. The primary markets look, however, as if they were weakening a little just now. The Canadian demand is of a quiet character and quotations are around $5 for foreign and $4.75 for domestic.

Preparation for Foundrymen's Convention, Toronto

Report of the Secretary as to What is Being Done—Secretary of Supply Association will be in Toronto until after Convention.

It is just one month now to the convention of the American Foundrymens' Association and allied associations. The convention will open on June 8 and last for one week. Subjects of everyday interest and value will be discussed. An exhibit of foundry machinery and equipment will be made by the Foundry Supply Association, which will be the largest and best ever made. No foundrymen can afford to miss this convention. It affords an opportunity for Canadian foundrymen picking up valuable information and hints which but few realize. It is an opportunity which has never been equalled. Canadian foundrymen should be at the convention to a man.

Report of Secretary.

The following letter from Dr. Richard Moldenke, is interesting :

Your secretary begs to report that active preparations for the Toronto convention are now under way. The local executive committee, with our vice-president for Canada, Mr. L. L. Anthes, as chairman, are doing their utmost to make the occasion a memorable one in the annals of our association, as well as an international courtesy on the part of Canada to the foundrymen of the United States.

The magnificent working exhibits now in preparation, will be installed in the several exposition buildings provided by the municipality, and it is expected that the Lieutenant-Governor of Ontario will open this, the first American exposition on Canadian soil.

The dignitaries of the city will receive us with the hospitality our northern brethren are noted for, and the beautiful city will be wide open, with a welcome for all.

Arrangements are being made for reduced rates, with possible stop-over privileges for Niagara Falls, notice of which as well as the hotels will be sent you later.

A radical change from the usual programme for the meetings is contemplated at this convention. Instead of the reading of elaborate papers, there will be a return to original principles, live subjects being discussed, so that our members and their interested friends may have the value of the experience of

others along their own lines. We have a few of these subjects selected and the promise of able speakers to introduce them systematically. We, however, want more material, and urge our friends to send in as soon as possible the questions of special interest to them which

DR. RICHARD MOLDENKE.

Secretary American Foundrymen's Association.

they would like to see discussed. We will then try to arrange for experts in these matters to take up the subjects for presentation. In this way it is hoped, especially as the convention meetings will be held in an entirely separate and admirable building, that the greatest value will be given our members.

It is expected that all foundry Canada will be there, and from present indications for the American side, the enormous attendance at Philadelphia promises to be eclipsed. Toronto will be well able to care for all who come.

The provisional programme, subject to change, is as follows :

Monday Morning, June 8—Exhibition will be ready.
Monday Evening—Meeting of the Associated Foundry Foremen.
Tuesday Afternoon, June 9—Formal opening of the convention and exhibition. Joint meeting of the American Foundrymen's Association, American Brass Founder's Association, Associated Foundry Foremen, and Foundry Supply Association.
Tuesday Evening—Official reception at the City Hall.
Wednesday Morning, June 10—Exhibition closed during the session. Business session of the association. Brass Association will hold meetings in separate building.
Wednesday Afternoon—Business session.
Wednesday Evening—Left open.
Thursday Morning, July 11—Exhibition closed during this session. Business session.
Thursday Afternoon—Business session.
Thursday Evening—Moonlight excursion on the lake.
Friday Afternoon, June 12—Trolley ride.
Friday Evening—Smoker.

A ladies' reception committee will see that the visiting ladies are well cared for and entertained. Automobile rides, shopping expeditions and theatre parties are on the programme for their especial delectation.

As the same rule which governed the entertainment of members only at Philadelphia will be strictly followed out at Toronto, members are urged to get their foundry friends to join the association. The annual dues are but $5, an insignificant sum in comparison with the information derived from the visit. The sessions of the association are free to all, as also the exhibition, but we would like to have all our foundrymen join the association and thus help to carry on the good work of utilizing the iron and fuel resources of this continent to the best possible advantage in our particular line of industrial endeavor.

What the Supply Association Are Doing

The secretary of the Foundry Supply Association, H. M. Lane, has taken up residence in Toronto until after the

H. M. LANE.

Secretary Foundry Supply Association.

convention, and in a short time now the installing of the exhibits will commence.

Mr. Lane's address will be care of the Toronto Foundry Co., Ltd., Toronto, Ont. Through the courtesy of Mr. L. L. Anthes, manager of the company, and vice-president of the American Foundrymen's Association, it has been possible to secure these advantageous headquarters, which are within five minutes' walk of the exhibit buildings.

Arrangements have already been made for the installation of a large amount of labor-saving machinery for making and handling molds, for preparing molding sand, and for other work about the foundry, so that this exhibit will certainly be the most complete of its kind that has ever been made.

For the first time in the history of the trade, all branches of the iron and brass foundry will be fully represented in operation, including core ovens and cupola and brass melting furnaces.

The still exhibits, which will occupy the Process Building, will also be unusually attractive, and many of the firms have plans on foot which will prove beyond question that the Process Building is not asleep, even if it does not make so much noise as its neighbor across the way.

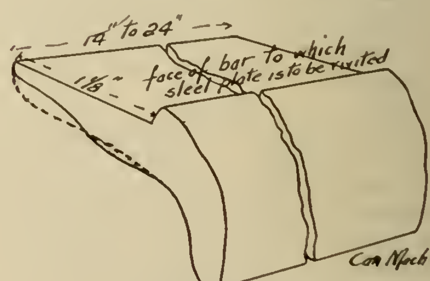
A PROBLEM IN MOLDING.

Editor Canadian Machinery, Toronto.

Dear Sir,—I am sending you a section of a cutter bar. The face of these bars (marked with a file), must be straight from end to end. They are 14 inches to 24 inches long, and a steel plate is riveted to the face and ground to a cutting edge. I cannot get them molded straight and I thought you might through your paper be able to give me some information that would help me out. I have tried all ways known to the molding trade and different mixtures of iron. I get best results by shaking out hot and standing them on end to cool. Is the pattern out of proportion ? They are made in a snap flask and jackets are used.

Yours truly,
T. B. B.

The accompanying sketch shows what is required. Since all the different schemes of molding have been tried, it would be natural to turn to the design of the piece. It has been suggested by a man of broad experience in molding that if the piece were redesigned so as to distribute the metal somewhat as shown by the dotted line, the difficulty would probably be overcome. It is most probably the distortion due to uneven cooling of the piece which makes it difficult to get a straight and even surface. The suggested redistribution of



A Problem in Molding.

metal would do away with this uneven cooling of metal. If any of our readers can make any suggestions which would help our correspondent, they would be much appreciated.—Editor.

Molding Machines: Principles Involved in Their Operation

Continued from Last Month—Illustrating a Pneumatic Roll-Over Machine Just Placed on Market, and a Machine for Multiple Molding.

Supplementing the article which appeared in the last issue on molding machines, illustrating various principles involved in machine practice, two other machines are herewith illustrated and described.

Tabor Roll-Over Molding Machine.

The Tabor Mfg. Co., Philadelphia, have just placed on the market a machine which solves the problem of turning over large molds and drawing the patterns on large machines without the use of cranes or hoists. The flask is rolled over and the pattern withdrawn by a centrally located air cylinder.

Fig. 1 shows the machine in its normal position to receive the flask and shows a half flask rammed up ready to be rolled over. Fig. 2 shows the machine after the flask has been rolled over and delivered on the leveling device before drawing the patterns. The leveling device is shown in Fig. 5. The equalizing support is Y-shaped and insures an accurate bearing for the bottom board. A central spring in the hub of the leveling device supports the upper portion upon which the flask rests. This supporting spring holds the moving portion of the leveling device in contact with the bottom part of the flask at three points, until the spherical surfaces at the three points come in contact, when the leveling device is securely locked and held in position until the pattern is drawn. When the flask is taken off the leveling device, the upper portion is raised from contact with the lower portion by the spring and is again ready to receive an irregular flask.

Fig. 3 shows the machine with the pattern drawn clean from the sand and Fig. 4 shows the pattern turned back and the mold ready for delivery. All of the foregoing operations, with the exception of ramming and clamping are accomplished by power, by simply opening and closing the air valves.

The pattern board is equipped with a very heavy vibrator and the patterns shown on this machine have parallel sides, eight inches high. The accurate-

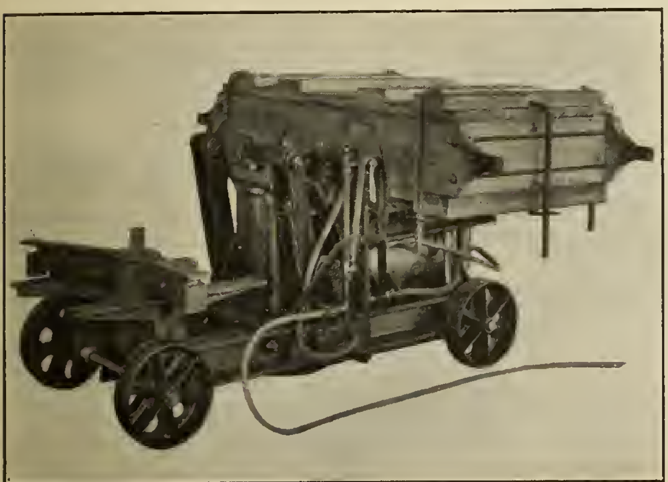


Fig. 1—Tabor Roll-over Machine in Normal Position.

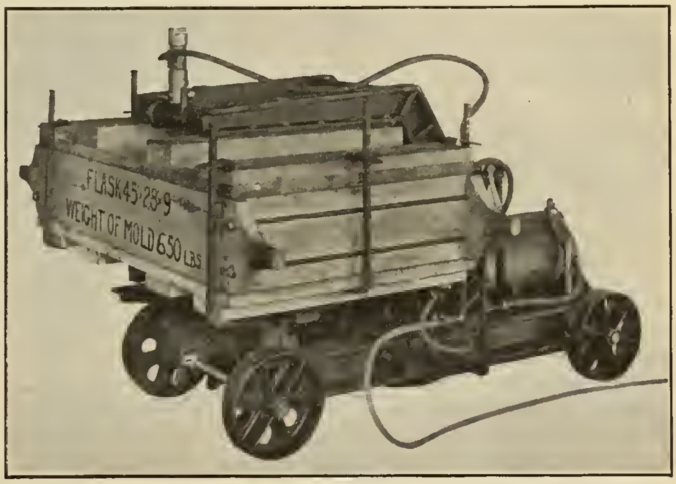


Fig. 2—Flask Rolled-over and Delivered to Leveling Device.

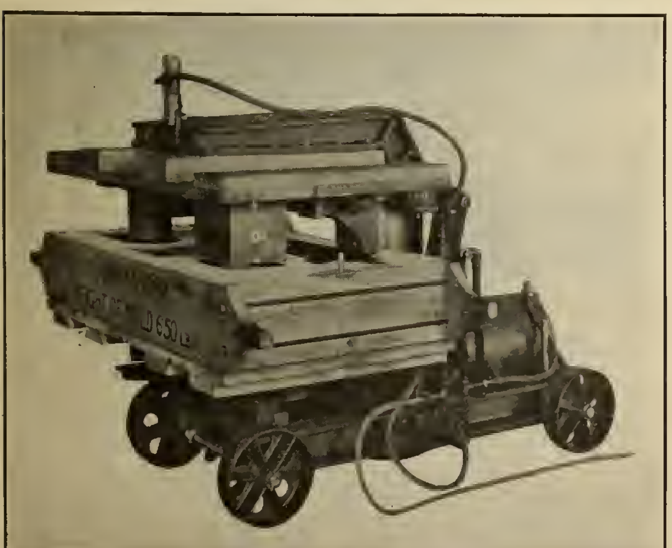


Fig. 3—Pattern Drawn From Sand.

Fig. 4—Pattern Turned Back.

ly machined guides on this machine make it possible to draw deep parallel patterns with the aid of draft. The flask shown is 45 x 28 inches and 9 inches high, and weighs 650 pounds, although flasks and pattern boards weighing up to 1,000 pounds can be handled on this machine, which is well adapted for jobbing foundry use and eliminates all of the heavy manual labor on large work.

Multiple Molding.

Multiple molding by stacking ordinary two-part molds with a continuous

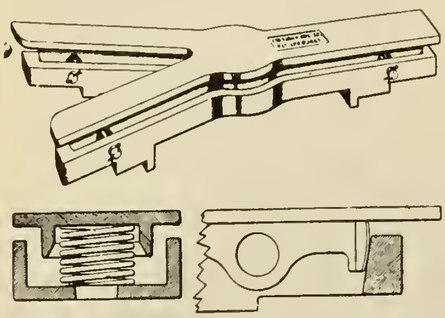


Fig. 5—Leveling Device, Showing Spring and Clamp.

sprue cut through all but the bottom, is old practice, and has been long used in iron foundries to economize in space and in steel foundries to obtain a greater density of metal. But it is in forming a molding face at the idle joint between the cope part of the one mold and the drag part of the one above that modern multiple molding comes in.

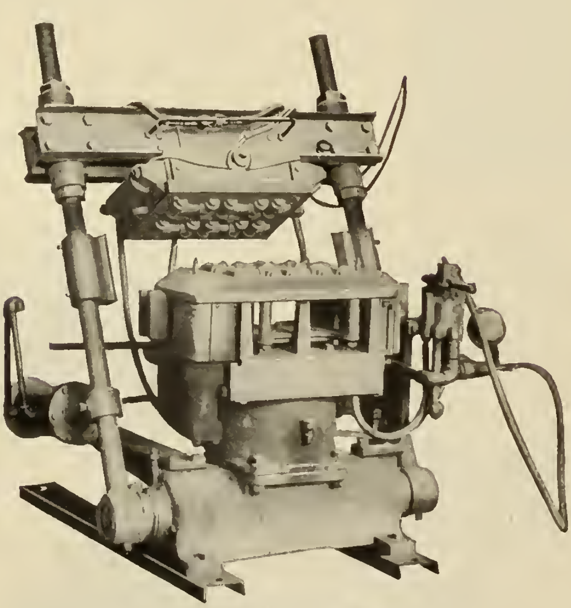


Fig. 6—Multiple Molding Machine: Upper Head Swung Back to Receive Flask.

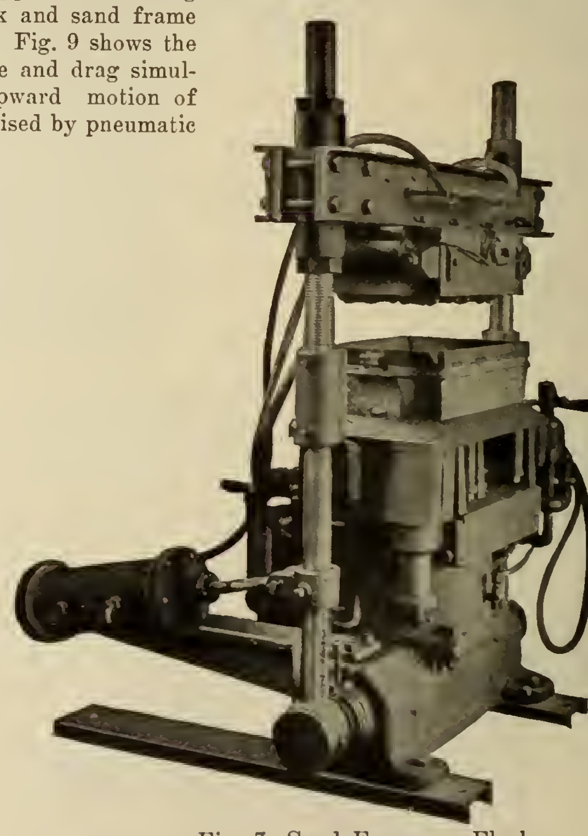


Fig. 7—Sand Frame on Flask.

To utilize this idle joint it is necessary to ram both faces of the multiple flask simultaneously. It is impossible to press a pattern down into a struck surface of sand.

In the Rathbone machine, John A. Rathbone, Detroit, illustrated in Figs. 6 to 9, this is accomplished by projecting the flask full of sand up against the drag patterns. Thus every time a half mold is made a whole one is made in the same flask, thus doing away with the necessity of rolling over. This is done by causing the unrammed sand in the flask with excess of sand enough in the removable sand frame over the flask, to allow for compression, to move up against and around the drag patterns fixed in the upper head of the machine with velocity sufficient to ram the mold by impact, ramming the drag mold simultaneously with the cope.

The illustrations show the style of the machine, and how it is operated. Fig. 6 shows the upper head holding the drag patterns, swung back to receive the flask which is placed on the lower head upon which are mounted the cope patterns. The yoke is swung back by means of the pneumatic cylinder shown.

Fig. 7 shows the yoke returned to its normal position and flask and sand frame in position. The sand frame is held to the upper head by means of electro magnets ordinarily, but when required is dropped on top of the flask by breaking the electro-magnet circuit.

Fig. 8 shows the upper head swung back to allow the flask and sand frame to be filled with sand. Fig. 9 shows the mold rammed, the cope and drag simultaneously, by the upward motion of lower head, which is raised by pneumatic piston and cylinder. The lower head is then lowered away drawing the drag patterns, the sand frame held to the upper head by the electro magnets. The frame is then swung back, the cope patterns drawn by lowering through lower head pneumatically. The mold is then removed.

In this machine the vibrators for both cope and drag are controlled automatically.

It is claimed for this machine that accurate returning or printing back of the drag patterns can be done when this is necessary after facing has been applied.

It is claimed that on plain work one man operating the machine, shoveling his own sand from the heap and stacking his molds, can put up from 60 to 80, 13 x 18-inch molds per hour; cored work, same size and under same conditions, 40 to 50 molds per hour.

Fig. 10 shows a sample of work from a stack of molds made on this machine.

DEPRECIATION OF MACHINERY.

No hard and fast rule can be established for marking off the value of machinery. The percentage of depreciation depends only in part upon the age of the machine; to a far greater degree it is affected by contemporaneous progress in the line of manufacture which it was designed to promote. The effect of these and other factors is clearly presented in the following extract from a paper by the well-known mill engineer

and architect, Mr. Charles T. Main, of Boston:

"The two most important things which determine the market value of machinery are:

"First: Its comparative ability to turn out a product in quantity and quality equal to that of the most improved machines.

"Second: Its actual condition with respect to wear and tear.

"Although a machine may not be worn out, or even may have been run but very little, it may be unprofitable to run, because other machines have been introduced which do so much more or much better work. These machines may be used to advantage in some other concern, and may on this account have more value than scrap. Parts of machines have been improved so that these portions may be changed while leaving a portion of the machine as before; as for example, cotton spinning spindles, so that depreciation might be applied to a portion of a machine instead of to a machine as a whole.

"The depreciation for actual wear and tear will vary with the severity of the work done; speed of the moving parts, the care taken in the running, and the amount laid out in repairs.

"It seems to me impossible to separate the depreciation from wear and tear altogether from that due to improvements, in arriving at its present value, and it is customary to treat them in a general way, allowing a definite depreciation to cover both.

"Any concern which does not lay aside, at least, five per cent. of the total value of its plant if new, and apply the same at intervals towards the renewal and improvements, will find itself at the end of twenty years in a position not able to compete with success with modern equipped concerns, and it will be necessary to make radical changes at great expense calling for new capital.

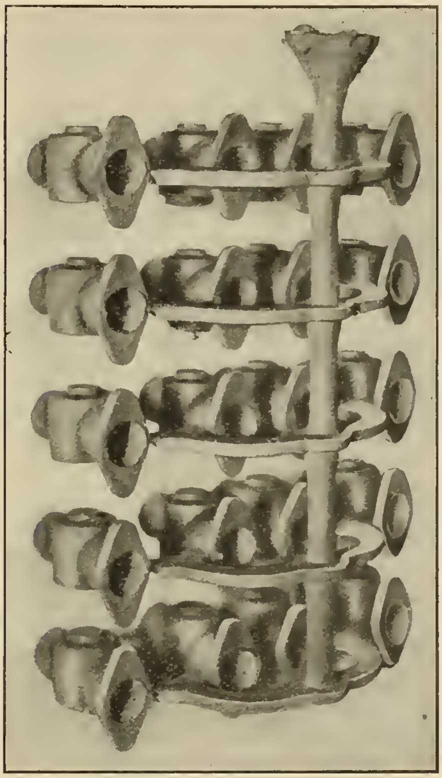


Fig. 10—Sample of Castings Made by Multiple Molding Process.

"If a sinking fund is created for replacing the machinery, three per cent. of the cost would replace it in twenty-four years. There is usually some value to machinery in a mill, even if the property were to be dismantled; but old machinery has no value except for scrap, which is very small, as the cost of taking down is about as much as the value of the scrap."

OBITUARY.

Mr. Chas. Drinkwater, assistant to the president of the C.P.R., died of pneumonia on April 23, after an illness of only six days. Mr. Drinkwater was born in England in 1843, and has been in the railway business since 1859.

Mr. A. L. Boughton, secretary of The Standard Sand & Machine Co., and second son of H. G. Boughton, president and general manager of above firm, died April 12th at his late residence, 1240 E-114th Street, Cleveland, Ohio, age 37 years, after a hard struggle of nearly six weeks from an attack of pneumonia which afterwards developed into an abcess of the left lung. He leaves a wife to mourn his loss.

Do unto the printed matter of others as you would have them do unto yours.

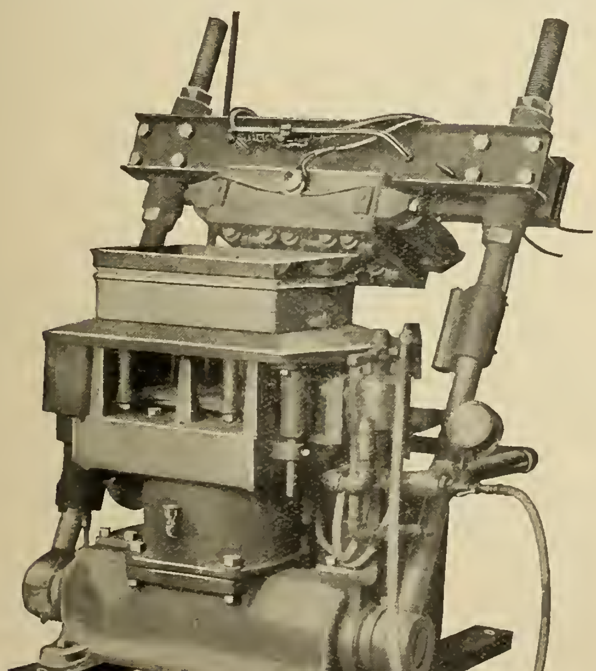


Fig. 8—Upper Head Swung Back to Allow Filling Flask and Sand Frame with Sand.

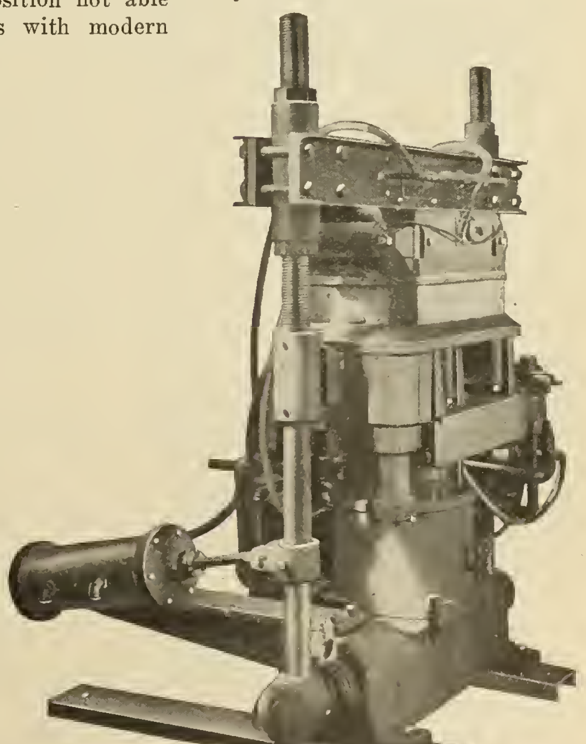


Fig. 9—Cope and Drag Molds Rammed Simultaneously by Single Motion of Ramming Head. Sand Frame Engaged by Electro Magnets.

CANADIAN MACHINERY
and Manufacturing News

A monthly newspaper devoted to machinery and manufacturing interests mechanical and electrical trades, the foundry, technical progress, construction and improvement, and to all users of power developed from steam, gas, electricity, compressed air and water in Canada.

The MacLean Publishing Co., Limited

JOHN BAYNE MACLEAN, President *W. L. EDMONDS, Vice-President*

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Vol. IV. MAY, 1908 No 5.

ABOUT BONUSING INDUSTRIES.

J. P. Downey, M.L.A., introduced a bill in the Ontario Legislature, making it unlawful for a municipality to offer inducements to manufacturers to establish themselves there, but it was defeated. Mr. Downey's policy is good, though he goes a bit too far, but sane business men will favor the introduction of the bill again next session, in a somewhat modified form. The editors of the MacLean papers have been in close touch with this question for many years, and have been steadily educating the business community to the evils of a system which offers inducements to a concern to remove from one centre to another, or the granting of sums of money to aid men or syndicates who had not yet shown their capacity to handle their own money successfully. The opposition to Mr. Downey's bill came from the representatives of the smaller localities, and it is they who are usually guilty of this unbusinesslike procedure. Let Mr. Downey aim next issue to prohibit cash bonuses or loans by municipalities to any industry.

Years of experience with this question leads those who have studied it, to the conclusion that the granting of concessions to manufacturers in the way of exemptions from taxation, and possibly water rates, are fair, and should be encouraged. In fact, exemption of all manufacturing plants anywhere in Canada, from taxation of any kind, would materially aid the development of manufacturing in this country and be profitable to the municipalities and country as well. On the other hand, the payment of a cash bonus has in nearly every instance been money mis-spent.

A small municipality may be excused for offering inducements to a concern situated in a very large centre where taxes are very high. In fact, it would be better for the country, as a whole, to have its manufacturing industries distributed as much as possible.

We are decidedly opposed to bonuses, except in very rare instances. The men who wish to establish new industries, if they have the experience and have shown their capacity to do things, will find no difficulty, in ordinary times, in securing all the capital necessary.

SHOULD HAVE BETTER ILLUMINATION.

Watch one of a night gang in a machine shop running around his machine with an incandescent bulb in one hand to pierce the semi-gloom of the shop; or go to church some Sunday night—not to listen to the sermon, but to see the people in the galleries blinking at the preacher through an immense electrolier of incandescent lights; then commune with yourself concerning the wretched illumination with which we provide ourselves more often than not.

A noted scientist is credited with the statement that the increasing amount of eye trouble is due to the increasing amount of electricity used; but is it not more likely due to our turning night into day, and putting continual strain upon our eyes with wretched illumination?

Illuminating is a science worthy of quite as much consideration as most other sciences.

If we wish to run our factories at night, and turn out work as quickly and efficiently as during the day, we must make some effort to imitate daylight in our illuminating. And this is not done without some study, and, perhaps, greater expenditure than is commonly laid out in factory illumination.

If we wish to have good eyesight like our forefathers had when they lived in caves or trees, slept when it was dark and woke when it was daylight, we need to revolutionize the illuminating of our public buildings, and not only have lots of light, but have it coming from such a source as to enable our eyebrows and eyelids to protect our eyes from the direct rays as nature intended.

The Central Railway and Engineering Club had this subject of illumination presented to them very forcibly at their last meeting by Mr. Fletcher, of the Canadian Westinghouse Co., and, no doubt, seed sown in this way will bear good fruit.

SO AS TO PROVOKE DISCUSSION.

The American Foundrymen's Association this year are adopting a policy which will bring out more discussion at their meetings during the convention here in June than has been heretofore. This is a move in the right direction. It is the discussion which is valuable; must more so than the laborious reading of lengthy papers, however much good information may be contained therein.

At a recent meeting of the Toronto branch of the American Institute of Electrical Engineers, a gentleman from the General Electric Co. gave a paper on high tension work.

It was a remarkably good paper in that it provoked interesting and educative discussion. This was not by accident, but by design. Point after point was brought up in the paper and presented without much said for or against. Question after question was raised in the minds of the assembled engineers. These questions started them thinking and afterwards talking.

It should be the aim of every educative association to have their papers presented in such a way as to provoke discussion.

PERSONAL MENTION.

Mr. E. C. Rutherford has been appointed Toronto agent for "Thermit."

* * *

Mr. Samuel Groves has been appointed editor of the Geological Survey publications, Ottawa, Ont.

* * *

Mr. John M. Wilson has been appointed construction engineer for the Wood Product Co., of Toronto.

Mr. Milroy, of Milroy-Harrison Co.

Mr. R. Hobson, general manager Hamilton Steel & Iron Co., is on an extended pleasure trip to Europe.

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Mr. J. H. Hanson, Montreal representative of the B. Greening Wire Co., Hamilton, has just returned from a business trip to England.

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Mr. John Anderson, foreman of pattern department of J. Stevens Co., Galt, has taken a similar position with the Page, Hersey Works, in Welland.

* * *

Mr. H. R. Charlton, advertising agent of the G.T.R., is in England arranging the Grand Trunk exhibit at the Franco-British International Exposition at Shepherd's Bush, London.

* * *

Mr. A. E. Warren has been appointed general superintendent of the second division of the Canadian Northern, which includes the terminals and branch lines running out of Winnipeg.

* * *

Mr. and Mrs. Barrus, London, Eng., have recently visited Athol, Mass. Mr. Barrus is manager of the London office of the L. S. Starrett Co., and with Mrs. Barrus went to England about two years ago.

* * *

Mr. F. E. Lovell, a member of the old established lumber firm of H. Lovell & Sons, Coaticooke, Que., who have extensive interests in mills and timber limits throughout the Province of Quebec, is the newly-elected president of the Canadian Crocker-Wheeler Co., Montreal.

* * *

Mr. George Holland, agent for the Continental Iron Works, New York, died at his home, Montreal, on April 15th. He was chief draftsman of the G.T.R. for many years and was a charter member of the Canadian Society of Civil Engineers and of the Engineers' Club, Montreal.

* * *

Mr. E. K. Spinney, Yarmouth, N.S., a prominent dealer in small tools, has been spending some time in Montreal. He reports trade good in the Maritime Provinces, and that collections were better there than a year ago. He anticipated that even a better trade would be done this year than in 1907.

* * *

Sir James Heath, a very prominent Staffordshire, Eng., ironmaster and collier proprietor, is visiting Montreal interested in the iron, nickel and other mineral deposits in Ontario and Northern Quebec regions. He is also looking after the possibility of carrying off contracts for steel rails in connection with new work on the C.P.R., G.T.R. and National Transcontinental.

* * *

H. M. Lane, Secretary Foundry Supply Association, has taken up his residence in Toronto until after the joint convention of the American Foundrymen's Association and the Foundry Supply Association in June. Until that time he will be very busy making all arrangements for the extensive exhibit of foundry supplies and equipment which will be made by the Supply Association.

ANNUAL CONVENTION OF CANADIAN ELECTRICAL ASSOCIATION.

The eighteenth annual convention of the Canadian Electrical Association will be held in Toronto, Wednesday, Thursday and Friday, June 10, 11 and 12, 1908. In selecting a place for this convention the Managing Committee considered a number of locations and finally decided upon Toronto as the most suitable place for this year's meeting.

The local arrangements are in the hands of the following committee: Messrs. R. G. Black (Chairman), J. J. Wright, W. N. Ryerson, W. A. Bucke, J. A. Kammerer, H. A. Moore, H. H. Macrae, W. G. Chace, T. F. Dryden, T. J. Lynch, W. H. Eisenbeis, C. H. Mitchell, W. B. Boyd, R. J. Clark and G. K. Hyde. The Committee on Papers consists of Messrs. R. G. Black and W. N. Ryerson.

Papers on the following subjects have been promised:

"How to Increase the Station Load"; "Loss and Unaccounted for Current"; "Various Electrical Power Plants by European Designers" (illustrated); "Modern Arc Lighting"; "Various Distributing Systems Adaptable to Cities and Towns"; "Power Rates and Factors which Influence Them"; "Regulation of Electric Currents or Circuits"; "Grounding of Transformer Secondaries"; "Long Distance Transmission by Means of Direct Current"; "Electrical Plant Earnings per Capita"; "Electrical Franchises, Their Legal Status and Basis of Valuation"; "Large Power Plants of America" (illustrated).

There will also be a legal paper on "Contracts."

NEW FIRM OF DEALERS.

The Milroy-Harrison Co. is the name of a new firm of manufacturers' agents and machinery dealers which has been started in Toronto at 66 Richmond Street East. The members of the firm are A. H. Milroy and H. A. Harrison. Both of these gentlemen have had considerable experience in the machinery business, Mr. Milroy having been manager of the supply department for H. W. Petrie, and Mr. Harrison having been general machinery salesman.

Mr. Harrison, of Milroy-Harrison Co.

The agencies which they have already secured include Ontario agency for Novo Steel, Toronto agency for Hamilton Tool Co., and Prescott Emery Wheel Co.

INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News.

Electric Power and Transmission.

Edmonton, Alta., will extend its power plant at a cost of $40,500.

Preston, Ont., has applied to the Hydro-Electric Commission for 800 horsepower.

A second electric plant will he installed at Euganla, Ont., near the Georgian Bay Power Co.'s plant, and a transmission line will he erected.

Machine Shop and Foundry News.

The Marvel Street Hydrant & Novelty Co., Lindsay huilding, Montreal, will huild a machine shop and foundry for the manufacture of their non-freezing hydrant and other patents next summer.

Max Bachem, mechanical engineer, has purchased the machine shop run hy Kinsey Bros., at 116 Adelalde street west, Toronto. Mr. Bachem will make a specialty of repair and machine work on gasoline, steam and electric motors, automobiles and motor hoats.

E. Scott, machinist, 91 Bleury street, Montreal, has just completed an extension to his machine shop and has added several up-to-date machines to his equipment. He does light manufacturing, specializing in punches and dies for sheet metal work and designing and huilding of special machinery.

Railroad News.

A hranch of the Illinois Car Co. may he started at Sydney, N.S.

The C.P.R. is projecting extensive stockyards in the east end of Montreal.

About 800 men were laid off at the Angus shops, Montreal, in the heginning of April.

The G.T.P. hope to have trains running from Winnipeg to Saskatoon hy the middle of May.

It is stated that a movement is on foot for the erection of an electric line from Ottawa to Brockville.

It is expected that a merger will take place hetween the New York & Canada Railroad and the Delaware & Hudson.

Trouhle is expected hetween the C.P.R. and metal workers at Winnipeg, owing to a ten per cent. reduction in wages.

Work has heen commenced on the M. & S.C. railway at Black's Bridge, Quebec, to connect St. Lamhert with Montreal.

The C.P.R. will erect a new station at Prescott and make changes in the yard there, involving an expense of $200,000.

The C.P.R. has granted the contract to Janse & MacDonnel, Maple Creek, Sask., for 36 miles of line hetween Lethbridge and MacLeod, Alta., at a cost of $15,000 per mile.

The Maoitoulin & North Bay Railway Co. are asking an extension of time for the construction of the railway connecting Manitoulin Island with Little Current and Sudhury.

The C.P.R. is planning considerahle improvements to their line in British Columhia during the coming summer. This includes the construction of five steel and concrete hridges in the Cowichan district.

Municipal Undertakings.

The Ross Rifle factory at Quehec will not he removed.

Calgary will erect a civic hospital at a cost of $100,000.

The Montreal Incinerator is to he rehuilt hy the city at a cost of $102,000.

The ratepayers of Toronto may vote on a hy-law for $650,000 for new hridges.

Work will commence immediately on the new western channel, Toronto, which will cost $495,-000.

Qhe Cornwall, Ont., council has granted a fixed assessment to the Canadian Colored Cotton Mills Co.

The water committee, Montreal, will spend $500,000 this year. A new pump to cost $29,-465 will he installed.

The Saskatchewan Government is taking definite steps towards the acquirement of the telephone lines of that province.

A deputation waited upon the Provincial Government asking that steps he taken to confine the Grand river to its channel.

The Province of Alherta will pay the Bell Telephone Co., the sum of $675,000 for its entire telephone system in the province.

The ratepayers of Kenora, Ont., have approved a hy-law granting immunity from taxation to the Maple Leaf Milling Company, and the reconstruction of the hig mills is now assured.

Municipal improvements will he carried on at Edmonton, Alta., this season, at a cost of nearly $200,000, of which amount $92,000 will he expended in sewer construction and $65,000 in waterworks extensions.

By-laws for the following amounts have heen carried at Edmonton, Alta.: $42,500, part cost traffic deck C.P.R. hridge; $10,000 sidewalk construction; $40,000, extensions to telephone system; $60,000, extension light and power system; $20,000, fire equipment and cost of new fire halls; $130,000, street railway extension and paving.

Saw and Planing Mills.

Arthur Sewell is erecting a sawmill at Gihson, N.B.

The Bathurst Lumher Co. will erect a concrete sawmill at Bathurst, N.B.

Brown, McMillan & Calder will erect a new sash and door factory at Welland, Ont.

The sawmill of Wm. Scott Lumher Co., near Fredericton, N.B., was destroyed hy fire.

Abraham J. Slater's steam saw mill at Richmond, Carleton county, N.B., has heen destroyed hy fire.

C. J. Moore, Victoria, B.C., proposes to erect a hig sawmill at Prince Rupert to supply the wants of the G.T.P.

The sawmill of F. D. Sadlier, Rowena, Victoria county, N.B., was destroyed hy fire recently. Loss about $5,000.

The St. Maurice Lumher Co. purpose erecting ten piers on the east side of the St. Maurice river, in the city of Three Rivers, Que.

Messrs. Taylor & Jamieson will rehuild their sawmill at Scotstown, Que., and will equip it with modern machinery.

The Macdonald Lumher Company and the Peterhoro Lumher Company, Lakefield, Ont., expect to open their mills next week.

J. D. McArthur, contractor, of Winnipeg, has honded fifty square miles of timher lands in Kilamon Valley, B.C., for a quarter of a million dollars.

The Vancouver Lumher Company are huilding an addition to one end of their mill, to allow for the installation of a new Mershom Saginaw hand re-saw.

At a meeting of the hoard of directors of the Louison Lumher Company, Limited, Sayabec, P.Q., held recently, it was decided to remove the head office to Jacquet River, N.B.

The St. John River, N.B., Log Driving Co. will raft ahout seventy million feet of logs this season, hringing sixty-five million from above Grand Falls and ahout six million from the Tohique.

The timher limits, sawmill, plant, supplies, mining lots, logs, etc., of the East Templeton Lumher Co., Ltd., East Templeton, Que., will he sold hy puhlic auction at Ottawa on September 15th, 1908.

The large sawmill at Bathurst, N.B., hought recently from the Summer Co. hy the Bathurst Lumher Co., was totally destroyed hy fire along with a large quantity of lumher. The mill has heen under repairs all winter and modern machinery had heen installed. The loss is about $75,000.

Companies Incorporated.

Ever-Safe Horseshoe Co., Midland, Ont.; capital, $100,000; to manufacture horseshoes.

Municipal Contracting Co., Montreal; capital, $100,000; to carry on a general contracting husiness. Incorporators, T. Sutton, V. Morin, hoth of Montreal.

J. and R. Weir, Montreal; capital, $100,000; to manufacture motors, engines, yachts. Provisional directors, J. C. Weir, R. S. Weir and G. Weir, Montreal.

Norfolk Gas Co., Port Dover, Ont.; capital, $60,000; to develop oil and mineral territories. Provisional directors, H. W. Ansley, F. W. Denton, and J. Law, Port Dover, Ont.

Sovereign Metalware Co., Toronto; capital, $1,500; to manufacture metalware. Provisional directors, J. H. Bramley, B. C. Bramley and S. F. Hayes, all of Toronto.

Queen City Motor & Dynamo Co., Toronto; capital, $40,000; to manufacture electrical machinery. Provisional directors, J. M. Ferniey, F. Marsh and W. Leslie, Toronto.

Maynooth Mfg. Co., Maynooth, Ont; capital, $40,000; to manufacture and deal in lumher and timher. Provisional directors, G. E. Weaver, G. Flynn and D. Smith, all of Maynooth.

The General Construction Co., Montreal; capital, $90,000; to carry on a general contracting husiness. Provisional directors, A. D. Morgan, G. A. Morrison and G. C. Tunstall, Montreal.

Manitoha Glass Mfg. Co., Beausyour, Man.; to manufacture all kinds of glass. Provisional directors, J. Kelllack, R. S. Beatty, G. Baham, Ed. Cullack and M. J. Hahan, all of Beansyour.

Inland Navigation Co., Hamilton; capital, $2,000,000; to manufacture and operate steamhoats, etc. Provisional directors, G. L. Staunton, F. Morison and J. G. Gauld, Hamilton, Ont.

Defiance Handle and Turning Co., Holstein, Ont.; capital, $40,000; to manufacture turned goods of wood. Provisional directors, A. J. Buller, N. G. Brehner and G. T. Calder, all of Holstein.

Rieder Electrical & Mfg. Co., Toronto; capital, $60,000; to manufacture all kinds of gas and electric fixtures. Provisional directors, A. W. Rieder, R. Gowans, A. E. Bowins and E. H. Wilson, all of Toronto.

Special Machinery Mfg. Co., Montreal; capital, $49,000; to manufacture and deal in machinery of all kinds, and take over the present husiness of the Special Machinery Mfg. Co., of Montreal. Incorporators, J. Vanderslice, J. Tees and L. Engelhorn, all of Montreal.

Water Works and Sewage.

Orillia may spend $75,000 for construction of sewers this year.

A new hoiler will he installed at the waterworks, Guelph, Ont.

The high pressure system for the West Ward, Montreal, will cost about $350,000.

Port Stanley, Ont., is to vote on the question of installing a waterworks system.

Yorkton, Sask., will issue $45,000 dehentures for the purpose of constructing a waterworks system.

Glace Bay, N.S., ratepayers will he asked to authorize the expenditure of $30,000 for water extension.

Woodstock, Ont., intend purchasing new pumps and extending the power lines at a cost of ahout $27,000.

Work will shortly commence upon the extension of the waterworks to cost $10,000, in Indian Head, Sask.

The council of Notre Dame de Grace, Que., has awarded Messrs. Henault & Heffernan a $70,000 contract for a new sewerage system.

Portage la Prairie ratepayers voted on a $50,-000 hy-law on April 28, to install and complete an auxiliary waterworks system.

Preston ratepayers will vote on a hy-law to raise $16,000 to construct a sewer system, and $10,800 for waterworks system.

The Department of Puhlic Works are considering plans for rehuilding the piers and lighthouse at Hamilton heach; estimated cost $25,-000.

Victoria, B.C., ratepayers will vote on by-laws to raise $70,000 for the high water pressure system, and $50,000 for sewerage extensions.

Bowman & Connor, consulting engineers, Toronto, are calling for tenders for pumping plant, pipe laying, etc., for the waterworks in Chesley, Ont.

The city council of Guelph have instructed W. M. Davis, C.E., of Berlin, to make a report for the enlargement of the waterworks system; estimated cost $125,000.

The waterworks commissioners, Brantford, Ont., will install a new suction pipe and two storage wells at the works, also other improvements; estimated cost $17,000.

Satisfactory tests have been made on the new turbine pump in the waterworks plant at Moose Jaw, Sask. It was supplied by the Allis-Chalmers-Bullock Co., Montreal.

A steam auxiliary plant will be installed in Victoria, B.C., in connection with the proposed high pressure system, instead of a gas plant, as formerly decided upon. The total cost of the high pressure system will be $70,000.

Willis Chipman, C.E., of Toronto, has submitted to the council of Burks Falls, Ont., a report upon the proposed improvements to the water system. Alternative estimates are submitted ranging from $34,000 to $50,000.

Trade Notes.

Two 40-h.p. electric motors have been installed in the car shops of the Dominion Coal Co., Glace Bay, N.S.

Two new 80-horse-power gas engines have arrived at Medicine Hat, Alta., and will be put in commission in the city waterworks plant.

The Harbison-Walker Refractories Co., Pittsburg, Pa., recently closed a contract for 2,000,000 of their high grade building brick for use in the Carnegie technical schools.

The contract for 1,450 tons of iron pipe for the 30-inch water main from Atwater avenue eastward, Montreal, was awarded to the Canadian Iron Foundry Co., Montreal.

The contract for the electric turret-turning gear of the U.S.S. Delaware, now under construction at Newport News, has been awarded the Cutler-Hammer Mfg. Co., of Milwaukee.

A partnership under the name of James W. Pike & Co., iron and steel merchants, Montreal, has been formed by James W. Pyke, general partner, and Thomas Prosser, special partner, for $35,000.

Mr. Abbott, Montreal, who represents the manufacturers of Novo steel in Canada, has appointed the Milroy-Harrison Co., 66 Richmond street east as agents for the Province of Ontario. They will carry a stock of this steel in Toronto.

The Kaufman Rubber Co., Berlin, Ont., have placed the order for 200 in. steel plate fan and heater, with about 10,000 feet piping for their new factory, with the Dominion Heating & Ventilating Co., Hespeler, Ont.

The Northern Engineering Works, of Detroit, have furnished the Goulds Mfg. Co. for the plant at Seneca Falls, a six-ton per hour Newten cupola. They have also shipped a similar cupola to the Raquette Foundry & Supply Co., of Pottsdam, N.Y.

The Westinghouse Electric & Mfg. Co., through its export department, has received a contract from the Dominion Iron & Steel Co., of Halifax, N.S., for a 500 h.p. electric generator, which will be used in the operation of one of the company's iron mines on Belle Island, Newfoundland.

The Hanna Engineering Company, Chicago, Ill., has acquired the line of pneumatic compression riveters, formerly manufactured by Quincy, Manchester, Sargent & Co., Plainfield, N.J. The latter company will devote its attention to the manufacture of metal-sawing machines, car steps, cranes and hoists.

The Smart-Turner Co., Hamilton, are supplying the following with pumps: Grand Trunk Railway,; Normal School, Peterboro, Ont.; Great Lakes Dredging Co., Port Arthur; H. Mark, Tavistock, Ont. They have also received an order for a seven-ton traveling crane from the Galetta Electric Light & Mining Co., Ottawa.

The Crescent Machinery Co., Montreal, is supplying the Canadian Copper Co., Copper Cliff, with six special jib cranes and ten special opening and closing devices for the smelter windbelts. They are also supplying the iron work, including axles, wheels, brake rigging, etc., for the scenic railway at Dominion Park.

The Stanton Iron Works Co., Ltd., Nottingham, England, is supplying Victoria, B.C., with cast iron pipe. The tonnage is between three and four thousand tons and will be delivered this summer. W. Beverley Robinson, Board of Trade building, Montreal, is the Canadian representative.

The name of the General Pneumatic Tool Co., Montour Falls, N.Y., makers of electric cranes and hoists, will be changed on May 18th to Shepard Electric Crane and Hoist Company, in order to harmonize the name with the product. The New York office of this company will be moved on April 22 from Singer building to the Fulton building, Hudson Terminal.

Messrs. Scott's Shipbuilding & Engineering Co. Ltd., of Grennock, have awarded the Bateman's Machine Tool Co., Ltd., Leeds, Eng., their contract for the supply of one 72"x72"x16' stroke high speed planing machine. This machine will be fitted with four tool boxes and will be arranged for motor drive with three cutting speeds of 20, 35 and 50 feet per minute and a return speed of 110 feet per minute.

The Manitoba Iron Works, Limited, Winnipeg, have secured the contract from the Jas. McDiarmid Co., Ltd., Winnipeg, for all the structural iron and steel in the new examining warehouse for the Dominion Government. This is the largest contract of its kind ever undertaken by a western firm, amounting to between seventy-five and eighty carloads of material. It is understood that the price is approximately $100,000.

Jones & Glassco, Montreal, the Canadian agents for the Campbell gas engine, will occupy the premises at 334 Notre Dame street west, Balmoral block, on May 1st. The will install a 10 h.p. Campbell oil engine there for demonstrating and testing purposes. It will be direct connected to a D.C. generator to furnish lighting for the office and warehouse. Several new machinery lines will be added and will be carried in stock.

Building Notes.

The new collegiate school, Moose Jaw, Sask., will cost about $80,000.

During March the building permits taken out in Winnipeg totalled $92,225.

Work will be commenced in the spring on a new post office building in Knowlton, Que.

A Catholic school will be built at Verden, Ont., at a cost of about $50,000.

The Dundas, Ont., School Board is contemplating the erection of a $16,000 school.

The Toronto Type Foundry Company will build on St. Antoine street, Montreal.

A new church, St. Andrew's, is to be built in Westmount, Que., at a cost of $60,000.

The Natural History Society, Montreal, will erect a new home, at a cost of $80,000.

A new school building will be erected at Craik, Sask., at a cost of about $12,000.

The Wesley Methodist church, Vancouver, intend building a new church to cost $100,000.

Hyatt Bros., London, have been awarded the contract for a new warehouse, to cost $22,000.

The Dominion Bank will erect a new building in Hamilton, Ont., at a cost of about $40,000.

A new post office will be erected on St. Joseph street, Quebec East, at a cost of $20,000.

The Dominion Bank, Walkerville, Ont., will erect a new building at a cost of about $30,000.

The city is planning the building of a technical school to cost between $40,000 and $75,000.

The Waterman Pen Co. intend erecting a $50,000 factory at St. Lambert, Que., this summer.

The congregation of North Parkdale Methodist church, Toronto, purpose erecting a new edifice.

Victoria College, Toronto, will erect a new library at a cost of $63,000. The architects are Sproatt & Rolph.

Zion Presbyterian church, Carleton Place, Ont., will spend $12,000 renovating their Sunday school hall.

J. McDiarmid & Co. have been awarded the contract to build the Winnipeg examining warehouse, to cost $276,000.

Procter, Moore & Stone rented the old drill shed in Stratford and will manufacture corrugated iron sewer tile.

Longueil, Que., council will erect a market and town hall on the site of the public market, recently destroyed by fire.

The Niagara Jockey Club, Fort Erie, Ont., will build new quarters and carry out extensions to the extent of $35,000.

Extensions are to be made to Molson's brewery, in the East End, and to Dow's brewery, on Chaboillez Square, Montreal.

Ouellett & Levesque, architects, Quebec, will shortly take tenders for a church to be erected at Matane, Que., at a cost of $40,000.

An Infants' Home, to be under the control of the House of Providence, Toronto, is to be built this year at a cost of $40,000.

A second fire station will be built in Regina this summer, at a cost of $10,000. It will be equipped throughout with hose wagon, ladders, etc.

The School Board, Kingston, Ont., have decided to equip all the city schools with fire escapes, involving an expenditure of about $4,000.

Plans have been prepared for the erection of a new $50,000 Brewery Mission building in Montreal, to be erected on the site of the present building.

The Post Office Department have secured from the G.T.R. a site on St. James street where they will erect a new building for handling railway mail.

The directors of the B.C. Agricultural Association have decided to call for tenders for a $12,000 building. Mr. France, of Victoria, B.C., is the architect.

Thomas Kelly & Sons, Winnipeg, have been awarded the contract for the erection of the new Nova Scotia Bank building at Winnipeg, to cost $250,000.

A new bridge will be built at Poplar Hill, Middlesex county, Ont. The bridge will be built of steel and concrete, 60 feet long, and will cost about $2,000.

The Rideau Curling Club, Ottawa, will erect a $20,000 rink. It is to be a 2½-storey brick structure, and work will be proceeded with as soon as possible.

It is reported that a new armory will be built for the Prince of Wales Fusiliers on Rachel street, Montreal, at a cost of $90,000. MacVicar & Heriot are the architects.

The Catholic commissioners are contracting for a $100,000 school, the De Salabery, to be built at the corner of Robert and Beaudry Sts., Montreal. It is to be absolutely fireproof.

An eight-room addition will be built at the Sophia street school, Hamilton, at a cost of $32,000. Plans have been prepared for an addition to the Pictou street school; estimated cost $250,000.

The M. E. Keefe Construction Company, of Halifax, have been awarded the contract for the erection of the new technical school building in that city, and also for the alterations to the Halifax post office.

General Manufacturing News.

Fire did damage to Hobbs' Glass Works, London, Ont., to the extent of $3,000.

The basket factory of W. T. Glover, at Burlington, Ont., was destroyed by fire.

At Moes River, Que., the shoddy mill of Mr. Perry was burned to the ground. Loss $5,000.

The premises occupied by the Goderich Engine & Bicycle Works, Goderich, Ont., are for sale.

The receivers for the Westinghouse Machine Co., East Pittsburg, Pa., have been discharged.

The Fairbanks-Morse Canadian Manufacturing Co. has increased its capital from $250,000 to $400,000.

A new company has been organized to take over the business of the Canadian Fire Engine Co., London.

The Petrie Mfg. Co., Hamilton, Ont., will erect a warehouse at Regina, Sask., at a cost of about $5,000.

The Atikokan Iron Company's plant at Port Arthur will resume operations with the opening of navigation.

The Brockville, Ont., Hat Works are to be enlarged by the addition of a three-storey structure, 70x40 feet.

The Imperial Wire and Steel Company, Collingwood, propose to extend their buildings and enlarge their plant.

The factory and plant of the Cornwall Furniture Co., Cornwall, Ont., was sold to M. F. Beach, of Iroquois, Ont.

Isaac Roadway, Barrie, has purchased a site in Toronto and will build a new carriage works at a cost of $6,000.

F. U. Smith, Quebec, has purchased the plant of the Perrin Plow Co., Smith's Falls, Ont., the price paid being $80,000.

The Brigden mill of the Hayne Milling Co., Limited, millers, Brigden and Marmora, Ont., has been destroyed by fire.

The Elevator Specialty Co., 162 Adelaide St., west, Toronto, have moved to the corner of Church and Lombard streets.

The New York offices of the Crocker-Wheeler Co., Ampere, N.J., have been moved to the Cortlandt building, Hudson terminal.

The Manitoba Linseed Oil Mills, Winnipeg, Man., will erect a large building at St. Boniface, Man., at a cost of about $75,000.

At a recent meeting of the Lake Superior Corporation, Sault Ste. Marie, Ont., C. D. Warren, Toronto, was re-elected president.

The Iron Range Railroad Development Co., Fort William, Ont., are seeking incorporation for the purpose of building a telephone system.

The George Hall Coal Co. of Canada, has just been incorporated and is now engaged in erecting a $100,000 plant on the Lachine canal, Montreal.

Work has been commenced on the plant for demonstrating purposes which the International Heating and Lighting Co. is erecting at Brandon, Man.

The P. R. Cummiug factory, Renfrew, Ont., has been sold to a company headcd hy J. E. Barnet, who will manufacture cream separators and other articles.

F. Smith, Quebcc, has bought the plant and interests of the Perrin Plow Works, Smith's Falls, Ont., for $80,000. The business will be centralized at Smith's Falls.

The Board of Trade, Owen Sound, Ont., received a report from the railway committee strongly advocating the completion of the Owen Sound and Meaford railway.

The Gourley, Winter & Leeming Piano Co., Toronto, has purchased the McMillan Piano Co.'s factory at Kingston, and will operate it in connection with the Toronto works.

The head offices of the Westinghouse Electric and Mauufacturiug Co., now at 111 Broadway, New York, and the New York sales and export offices have heen moved to 165 Broadway, New York.

H. H. Williams & Company, real estate agents, Toronto, report the sale of a site on Agnes St., near University avenue, to W. Lunenfeldt, who will erect a metal factory to cost $15,000.

The factory of the Canadian Steel Specialty Co., Gravenhurst, Ont., is now in operation. They hape installed a complete line of machinery, including several special machines of their own design, for the manufacture of wire chairs.

The Standard Implement Co., Port Stanley, Ont., recently organized with a capital of $50,000, purpose erecting a factory immediately. They intend to manufacture and sell farm implements, more particularly disc plows for horse power and engines.

The old plant of the Ontario Tack Company, Hamilton, which company recently amalgamated with the Canada Screw Co., will close down this week so that the machinery can be removed to the new building erecting in connection with the Screw Works. It is expected that the tack couccrn will commence operations in its new home on or about May 15.

The Roxton Pond Tool & Mill Co., of Roxton Pond, Que., have resumed work upon their huildings and plant. This company, formerly known as the Stanley Rule & Level Co., of New Britain, Conn., hought out W. S. Bullock's plane manufacturing business and are spending a large amount on construction work. The plant will be made up-to-date in every particular.

The Ontario Lantern and Lamp Company, of Hamilton, has taken out a permit for an addition to its plant to cost about $4,000. The extension will be made to the incandescent lamp department, which is at present too small to accommodate the increasing business of the firm. About 6,000 square feet will be added aud a lot of new machinery installed. The Ontario Lantern and Lamp Company since starting, about five years ago, has increased its business about 100 per cent. A short time ago the firm made an extension to its hurner and lantern departments.

Australia to Make Rifles.

It is reported that the commonwealth of Australia is taking steps for the erection of a plant for the manufacture of rifles for her own use.

Money Easy in England.

C. M. Hays, of the G.T.R., recently returned from England, says that everything Canadian is being taken up at once. Money is easy over there and people are confident.

Extension Granted.

An extension of time till January, 1909, has heen granted in connection with the act passed by the Ontario Legislature requiring all stationary engineers to have certificates.

Sherbrooke's New Works.

E. & T. Fairbanks have awarded the contract for the erection of their scale and valve works at Sherbrooke to C. E. Deakin, Montreal. The plant will include iron and brass foundries.

Canadian Capital Wanted.

A communication has been received by the C. M. A., suggesting that Canadian money be invested in an enterprise to establish a modern electric railway system in the city of Arequipa. South America.

No Capital Lock Nut Plant for Welland.

It was reported some time ago that the Capital Lock Nut Co., Columbus, Ohio, were about to establish a plant in Welland. A communication from them says: "No deal has heen closed as far as we know."

To Make Extensions.

Reid & Brown, the oldest jobbing foundry firm of Toronto, has dissolved partnership. The business will he continued by Hugh Reid and his three sons, who will make extensive additions to the plant and engage in the manufacture of structural iron and structural steel castings.

John Inglis' New Machine Shop.

The new machine shop of the John Inglis Co., Ltd., Toronto, is now complete, and all the machinery installed. The shop is a very bright one, a very large proportion of the wall surface being glass. The construction is structural steel and brick, with concrete floor. Considerable new machinery has been installed. A complete description of this shop, with illustrations, will appear in a later issue.

A Settlement Possible.

The dispute hetween the Dominion Coal Co. and the Dominion Iron & Steel Co., which is to come hefore the Privy Council at an early date, may he settled out of court; hut the time which has elapsed since the presidents of the two corporations, Messrs. James Ross and J. H. Plummer, first came to Toronto with that in view, makes a settlement seem farther off than ever.

Another Power Proposition.

The latest plan far competing with the Hydro-Electric Commission is one of the Weber Gas Engine, Toronto and Kansas City. They propose to establish producer gas plants and electric generators in the manufacturing districts of Toronto and sell the power to the industries nearby. Their plan received an abrupt check, however, from the city council, which at present refuses to grant a 50-year franchise, and also refuses to give permission for stringing of wires overhead.

To Establish Canadian Branch.

Rogers, Brown & Co., of Buffalo, have taken the selling agency for the Atikokan blast furnaces and will prohably open an office in Toronto. The Atikokan company has hitherto found it difficult to dispose of its pig iron on account of the uncertainty of manufacturers as to its suitability for their uses, and some 2,000 tons are lying at the wharf here. Rogers, Brown & Co. have induced some manufacturers to take it on trial, and so far the results have been satisfactory. The iron grades favorably and promises to be a soft, strong iron.

Output of Ontario Mines.

From the mines of Ontario were taken in 1907 metallic minerals valued at $14,309,702, according to the reports made to the Bureau of Mines. The production of non-metallic minerals was valued at $10,033,600, or a total output of the mines and mineral works worth, according to the prices at the place of production, $24,343,302. This was $1,954,919 in excess of the value of the output in 1906.

Two Large Planers Installed.

Two large new rail planers have just been delivered and installed in the Grand Trunk shops in Toronto hy John Bertram & Sons Co., Dundas. These are special planers designed by this company for rail work. Features of these planers are: The long bed made in one casting, 30 feet or more, and the table being gibbed to the hed, instead of resting on V's. This last feature was specially specified hy the Grand Trunk.

Opened Canadian Office.

The British Insulated & Helsby Cables Co., Ltd., have opened up offices in the Power building, Montreal. The office is in control of Mr. Lawford Grant, who is the chief engineer of the company in Canada.

From this headquarters they will supply both Canadian and United States business. This firm has a wide reputation as manufacturers of electric wire and cables, electric traction, lighting, power, telegraph and telephone equipments.

Another Dispute Perhaps.

It is rumored in Sydney, N.S., that a dispute equalling, if not surpassing, in magnitude the existing legal embroglio hetween the Dominion Steel and Coal Companies, is brewing between the Dominion Iron & Steel Company and the Nova Scotia Steel & Coal Company over certain iron areas at Wabana and certain coal delimitations at Point Aconi.

The Wabana deposits in question, it appears, only came to light after the transfer of million-dollar areas to the Dominion Iron & Steel Company ten years ago, and both companies, it seems, claim equal interest in them.

Dominion Coal Co. Annual Report.

The annual report of the Dominion Coal Co. shows the output for 1907 was 3,541,253 tons, as compared with 3,552,746 tons in 1906, or 11,493 tons of a decrease. The decrease was due to the fact that mining operations had not been resumed at No. 7 mine since the fire in December, 1906.

The following figures show the net earnings for the year ending 1907: $2,094,539, as compared with $1,137,370 for 1906. After payment of dividends and charges there was a balance of $1,002,368, as compared with $631,815 for 1906. The surplus stands at $2,828,308, as compared with $2,025,940 for 1906.

Whitman-Barnes Plant Destroyed.

The manufacturing plant of the Whitman & Barnes Mfg. Co., at St. Catharines, was totally destroyed by fire on April 16. In this factory were made edge tools and knives. This is one of three plants operated hy this company, the main office and plant being in Chicago, and the other manufacturing plant being in Akron, O.

The origin of the fire remains unknown. The loss is estimated in the vicinity of $150,000, between $30,000 and $40,000 having been spent on improvements during the winter.

Nothing definite has yet been decided by the management in regard to rebuilding.

Milton Hersey Company.

With the growth of system in cupola and foundry practice the Milton Hersey Co. has been incorporated in order to obtain the most competent men in testing lines. While paying special attention to foundry lines, iron coke and coal, they also carry on business as civil, mechanical, mining, chemical, electrical and sanitary engineers and make tests and assays of any kind.

The personnel of the company is comprised of Milton Hersey, M.Sc., Thomas S. Glauding, Charles R. Hazen, Charles H. Lester, analytical chemists, who are all practical men and each capahle of taking charge of their particular part of the work.

Nova Scotia Steel.

The annual meeting of the Nova Scotia Steel Company was held at New Glasgow, N.S., on March 25th. In his report President Robert E. Harris, K.C., said that the mines and plant of the company were kept busy during the year and that the output of iron was the largest in the history of the company. A new forge had been installed, and the works at Trenton were improved. During the month of February, 1908, the blast furnace produced the largest output of iron with the lowest cost since it went into operation. "So far as I am able to understand the situation," he said, "the indications, in my opinion, point to improved conditions hefore the end of the year."

The Cement Manufacturing Industry in Japan.

Only a few years ago the manufacture of cement in Japan was making very slow progress, the monthly supply throughout the country scarcely exceeding 600,000 barrels. Of late with the increase of various enterprises, such as railway construction, waterworks, water power, electric works, etc., the demand is described as growing hy leaps and bounds, and pressing the mills for more output and greater facilities. At present the total output throughout the country reaches about 1,300,000 barrels per month. The foreign-made product has diminished under the competition until last year, when it went from 23,000 yen in 1905 to 10,000 yen in 1906 and to 95,000 yen in 1907. The production of cement is, however, hecoming an industry

suited to this country, and the home manufactured article will occupy the market.

Transformation of Canada Foundry.

Since the Canada Foundry, Toronto, started making locomotives there has been a very considerable change in the appearance of the machine shop and foundry, and a person perfectly familiar with the plant four years ago would scarcely recognize the shop interiors at the present time. In addition to the boiler shop, which was erected for locomotive work, a large addition was made to the machine shop as an erecting shop.

Practically all the machines on the main machine shop floor are occupied with locomotive work at present. On every hand in the foundry also can locomotive work be seen.

Locomotives are being built for the Canadian Northern and the Grand Trunk Pacific.

New Locomotive Works for Lachine.

In our November, 1907, issue we announced the carrying of a by-law by the ratepayers of Lachine, giving concessions to an English syndicate to establish a locomotive works at Lachine. For a cash bonus of $50,000, exemption from taxation for twenty years and a reduction in the water tax, the syndicate will build a plant costing $2,500,000, and employ 500 men at the beginning of the first year, and 1,500 at the end of the third year.

This new concern, the Imperial Locomotive Works, Ltd., has purchased the Johnston farm, consisting of 100 acres, and operations will be started during the coming spring. This new enterprise is an off-shoot of the immense works of Beyer, Peacock & Co. While the heads of the departments may be brought out from England, the concern is to be Canadian and everything Canadian will be used in the construction of the plant.

How About Pulpwood Industry?

E. N. Lewis, M.P., before Canadian Club in Toronto :

The pulpwood phase, itself a problem of national importance, resolved itself, Mr. Lewis said, into this query : "Is Canada to go on exporting, in ever-increasing quantities, a great natural asset in its practically natural state, or is she to take such action as will result in its manufacture within her own borders, and thus have many millions of dollars paid to Canadian labor, in place of United States labor, as at present ?"

After discussing the present situation in Ontario, Quebec and New Brunswick, the speaker declared his belief that it was possible, as Sir William Van Horne, Sir Thomas Shaughnessy, Mr. E. S. Clouston, manager of the Bank of Montreal, Manager Rowley, of the Eddy Co., and many others had said, to have the wood manufactured in Canada, with all that would mean in the way of employment, to say nothing of the allied industries that would spring up, and he believed with them that it should be done.

An Old Plant Remodelled.

The old engine and boiler works of the Canadian Shipbuilding Co., foot of Bathurst St., Toronto, which were purchased by the Berg Brick Machinery Co., Ltd., have been completely remodelled, considerable new machinery installed and the old machinery completely renovated.

Before taken over by this firm, the works were in pretty bad shape ; but the work which has been put on the several shops have made them practically new. The new equipment which has been added, in the way of tools and traveling cranes, etc., make the plant quite up-to-date.

Handsome offices have been fitted up, and a feature is the bricking of the passageway with the various styles of brick made on the Berg machines.

At a later date the present foundry will be merged into the machine shop and a new foundry built. This will necessitate more new equipment.

Large Electric Installations.

Montreal is noted for the great amount of electric power used for factories, railways, streets and buildings. Power is brought in from Lachine rapids, and Shawinigan Falls, on the Maurice river, and the amount of power required is steadily increasing. In the Montreal terminal station of the Shawinigan Water & Power Co., at Maisonneuve, are two large generator sets, built by the Crocker-Wheeler Company, who have formed a Canadian company for the manufacture of Crocker-Wheeler electrical machines.

Each unit consists of a 2,000 h.p. 30-cycle synxhronous motor, driving a 2,000 h.p. 60-cycle, 2-phase, 2,300 volt, alternating current generator. The power from these two sets is sufficient to light up sixty thousand, sixteen caudle power incandescent lamps.

Another large electrical installation in Montreal is the new station on Notre Dame street of the Montreal Street Railway. The units consist of a 1,000 k.w. Westinghouse generator and a 1,000 k.w. and 2,000 k.w. General Electric geuerator. Provision has been made for the addition of another large unit when necessary. The switchboard is of a special design by the engineer of the Montreal Street Railway. The vertical engines are supplied with steam from ten B. & W. boilers aggregating 5,000 horse-power.

The plant is equipped with a Green economizer. The method of feeding the coal and disposing of the ashes is an unique arrangement. The coal is dropped from the car into a hopper and passes through a breaker and drops into a rotary filler. Each hopper of the rotary filler fills a bucket and the coal is carried to a receiving room above the furnaces. From here it is deposited through tubes on the chain grates. The ashes are carried out by another conveyor and deposited in cars.

Trade in Montreal and the East.

"The locomotive plant is going ahead—of that rest assured." This is what one of the interested parties writes us in regard to the new Imperial Locomotive Works for Lachine. Contracts have already been received from the local railways for the manufacture of locomotives, and prospects for the new industry are very bright. The concern will be Canadian, and everything entering into the construction of the plant will be obtained in Canada as far as possible.

The E. & T. Fairbanks Co. will erect a scale and brass-fitting foundry in Sherbrooke and prospects are good for a number of factories going ahead.

In discussion with some of the business men we find that, so far, 1908 has come up to the average of the last three years. In the Maritime Provinces business is as good as 1907 in most lines and the equipping of the new Intercolonial shops at Moncton is helping the machine tool trade.

The dependence of the Maritime Provinces on the natural products has prevented even talk of depression reaching that part of Canada. Montreal harbor will soon present a scene of industry and with the moving of the heavy-laden freight vessels trade generally will again be at high pressure. Everything indicates good business in uearly every line.

Some large orders are being booked for railroad supplies and as construction is being taken up heavier movements are looked for. Although many contracts have been placed, some are still open and prospects for supplies are, therefore, most encouraging. The construction of an electric road between Montreal and St. Lambert has been started and this should make local calls for material heavier.

The spring trade in bolts and nuts for bridge construction appears to be opening up and prospects in this line are fairly good.

The trade in foundry supplies and fire-brick is good and orders are numerous. In the machine tool line there are many inquiries and some good business is in sight, though some manufacturers hesitate to sign the orders. However, a few good orders have been received in addition to a number of smaller ones. A good trade in both special and general lines for shop equipment is looked for, and the numerous inquiries point to a good trade this coming month in machine tool, electrical and mining machinery.

Charles R. Hosmer, one of the most prominent financial and business men of Montreal, made the statement that viewing Canada from the Atlantic to the Pacific, he failed to see why Canadian people should not have the most optimistic feeling in the immediate future of the country. Look where you will, he said, and you will find evidence of returning activities, not only in one line of business, but in every avenue of our financial and industrial life. The whole Dominion is awakening to a new era of national prosperity.

CATALOGUES OF THE TRADE.

STOCK LIST—A complete list for 1908 of the stock of the A. R. Williams Machinery Co., Toronto.

BUTT-WELDING—Pamphlet describing butt welding by the thermit process. Published by the Goldschmidt Thermit Co., New York.

ROCK DRILLS—Catalogue 1 of the Ingersoll Sergeant of Canada, Montreal, illustrating their rock drills for mining aud contracting work.

PENBERTHY LUBRICATOR—Booklet No. 1, issued by the Penberthy Injector Co., Windsor, Ont., telling about their new sight feed steam lubricators.

DRILLS—Catalogue of twist drills manufactured by Lincoln-Williams Twist Drill Co., of Taunton, Mass. Tables of stock sizes are given. Illustrated.

ELECTRIC SWITCH—Bulletin and price list from the Hill Electric Switch Co., Ltd., 1500 St. Lawrence street, Montreal, describing their type "D" switches.

REAMERS—An attractively arranged folder briefly describing "Paradox" adjustable reamers, manufactured by the Cleveland Twist Drill Co., Cleveland, Ohio.

FANS—Pamphlet describing the growth and present products of the B. F. Sturtevant Co., Hyde Park, Mass. Their multi-vane fan for ventilatiug purposes is fully described.

MOTORS—Bulletins 95—100 of the Crocker-Wheeler Co., Ampere, N.J., describing, with illustrations, their D.C. and A.C. motors and generators, switchboards and installations.

ENGINE LATHES—Catalogue S, issued by the Lodge & Shipley Machine Tool Co., Cincinnati, Ohio, describing with illustrations their engine lathes of all sizes from 14 to 48 inches.

KEROSENE OIL ENGINE—Illustrated price list of the Remington kerosene oil Engine from Dinning & Eckenstein, 205 St. James street, Montreal.

DRILLS AND CHUCKS—Catalogue 67 issued by the Whitman & Barnes Mfg. Co., Chicago, of "Economy" and "Norka" high speed twist and flat drills and chucks, giving stock sizes.

VERTICAL GAS ENGINE—Catalogue H., section 1, of the Bruce-Meriam-Abbot Co., Cleveland, O., taking up in detail their vertical gas engines ; and also touching on their suction gas plants.

HEXAGON TURRET LATHE—Illustrated catalogue from Mussen's, Ltd., Montreal, describing fully the Alfred Herbert hexagon turret lathe, showing tools, dies, etc., and specimens of work accomplished on it.

TOOL HOLDERS AND TOOLS—Catalogue of lathe, planer and shaper tools and holders manufactured by the O. K. Tool Holder Co., Shelton, Conn. This system is one which machine shop superintendents should see.

MINE EQUIPMENT—Pamphlet from the Jeffrey Mfg. Co., Columbus, Ohio, U.S.A., and Montreal, describing and illustrating their fans, hoists, conveyors, drills, locomotives, etc., for use in mines and in industrial establishments.

THE HYATT ROLLER BEARING—Bulletin No. 31, illustrating and describing this bearing, issued by Hyatt Roller Bearing Co., Newark, N.J. Contains a complete price list and data to determine the bearing required under various couditions.

VISES AND TOOLS—The 1907-08 catalogue of the Hollands Mfg. Co., Erie, Pa., of vises, machinists' and plumbers' tools, natural gas burners. This is a 72-page booklet containing price lists and illustrations, very considerable space being given to the large variety of vises handled.

STICKNEY ENGINES—Bulletin sent out by the Ontario Wind Engine & Pump Co., Toronto, minutely illustrating and describing the Stickney gasoline engiues made by Chas. A. Stickney Co., St. Paul, for which company the Ontario Wind Engine & Pump Co. are Canadian sales agents.

DOWN DRAFT FURNACES—An 80-page catalogue issued by the Hawley Down Draft Furnace Co., Chicago, describing their Schwartz melting and refining furnaces for foundry use. These furnaces are built in all sizes and work equally well with crude oil, fuel oil or gas for fuel. This catalogue is a very handsome one.

TURRET LATHES—Catalogue of 150 pages describing the Hartness flat turret lathe, manufactured by Jones & Lamson Machine Co., of Springfield, Vt. This lathe is built in two sizes, for bar and chuck work. Speed tables, diagrams of chuck and bar work and numerous illustrations of a great number of different parts manufactured on this lathe are included.

FOUNDRY SUPPLIES—Two catalogues from Francis Hyde & Co., 31 Wellington street, Montreal, importers and dealers in foundry supplies, wheelbarrows, scrapers, cement, etc. They are tastefully gotten up, one being bound in a heavy cover giving sizes and illustrations of their large and complete lines of fire-brick. This also contains the weight per cubic foot of the metals, with their melting points, and the weights of coke, cement, lime, concrete, etc.

REMINGTON BILLING TYPEWRITER—Catalogue descriptive of the Remington typewriter for billing, and also contains numerous testimonial letters from firms in very many classes of business.

BOOK REVIEWS.

HANDBOOK OF PRACTICAL MECHANICS—Revised 1908 edition of this handbook, by Chas. H. Saunders. Size, $6\frac{1}{2}$x$4\frac{1}{2}$ ins.; published and sold by E. H. Saunders, 216 Purchase street, Boston, Mass. Sold in Canada by MacLean Pub. Co., Toronto. Price: cloth, $1; imitation leather, with flap, $1.25; real leather, with flap, $1.50.

The first edition of this book appeared in 1894, and at that time it received much commendation because of its real practical value to mechanics, particularly machinists and foremen. Each edition since then has been improved. The best features of it are the good practical information presented in simple form, and the complete index to the contents.

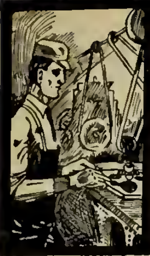
HYDRAULIC ENGINEERING—A treatise on the properties, power and resources of water for all purposes. By Gardner D. Hiscox, M.E.; 307 pages, 6x9 ins.; 300 illustrations, with 36 practical tables; published by Norman W. Henley Pub. Co., New York; sold in Canada by MacLean Pub. Co. Price, $4.

This is a practical book, higher mathematics being avoided. It covers the whole subject, starting with an historical chapter, and following on with chapters on properties of water, thus working up naturally to the more difficult considerations.

The contents of the book include a consideration of the measurement of streams, the flow of water in pipes or conduits, the horsepower of falling water, turbine and impact water wheels, wave motors, centrifugal, reciprocating and air-lift pumps.

HILL KINK BOOKS—Compiled by F. H. Colvin and F. A. Stanley; cloth bound; 4 ins. by 6 ins.; illustrated; published by the Hill Publishing Co., 505 Pearl street, New York. Price, fifty cents each.

The complete set of kink books consists of ten volumes of pocket size, containing valuable information, with illustrations of work in the machine shop. The books are as follows:—Drill Press, Patternmakers', Press Tool, Screw Machine, Repair, Milling Machine, Screw Thread, Drawing Room, Toolmakers', and Jig and Fixture Kinks. Valuable information and ideas are contained in these volumes written by practical men and well illustrated. The book on patternmaking is full of helpful hints on the way to cut lumber for best results, tools, core box work, etc. The Screw Machine Kink book is a valuable one and explains the making of screw machine tools, the setting up of automatics and the tools for it. The Jig and Fixture book contains standards for bushings, how to obtain accurate locations of holes, the process of jig making and points on various types of jigs. Each volume contains valuable information in its own sphere and is of proper size to be easily carried in the pocket or tool chest.



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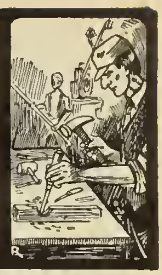

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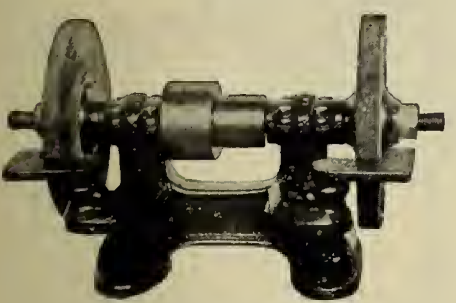

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BY young man having A-1 connection with all users of power in Montreal and vicinity; 3 years with present firm. Commission basis preferred. Staple or special lines. Apply Box 91 C, CANADIAN MACHINERY, 232 McGill St., Montreal.

AGENTS WANTED.

AGENTS WANTED, well connected with Railway Directorates, for introducing a well known article referring to Sleepers of Permanent Way. Address in first instance, O. K. 3616, care Rudolf Mosse, Berlin S.W. 19, Germany. (6)

BRASS AND COPPER TUBES, SHEETS, STRIPS, etc., English manufacturers knowing Canadian market, require smart, pushing agent, who understands the trade, for Quebec and Maritime Provinces. Apply, in confidence, with full particulars, to Box 99, CANADIAN MACHINERY, 88 Fleet St., E. C., London, England. (7)

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John McDougall Caledonian Iron Works Co., Montreal.
Smart-Turner Machine Co., Hamilton.
Waterous Engine Works Co., Brantford.
Williams & Wilson, Montreal.
Wilson, J. C., & Co., Glenora, Ont.

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Smith, J. D, Foundry Supply Co., Cleveland, Ohio

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Hamilton Facing Mill Co., Hamilton.
Smith, J. D., Foundry Supply Co., Cleveland, Ohio

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Dominion Foundry Supply Co., Montreal
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Gas & Electric Power Co, Toronto
Hamilton Facing Mill Co., Hamilton.
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Dominion Foundry Supply Co., Toronto
Hamilton Facing Mill Co., Hamilton
Northern Engineering Works, Detroit
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Cincinnati Milling Machine Co., Cincinnati

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Butterfield & Co. Rock Island, Que.
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Pratt & Whitney Co., Hartford, Conn.
Sheldon's Limited, Galt.

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Rice Lewis & Son, Toronto.

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Union Drawn Steel Co., Hamilton.

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Armstrong Bros. Tool Co., Chicago

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London Mach. Tool Co., Hamilton
Niles-Bement-Pond Co., New York.

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A. B. Jardine & Co., Hespeler, Ont.
London Mach. Tool Co., Hamilton, Ont.
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London Mach. Tool Co., Hamilton.
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Rice Lewis & Son., Toronto.
London Mach. Tool Co., Hamilton, Ont.
Niles-Bement-Pond Co., New York.

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Bickford Drill & Tool Co., Cincinnati.
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Rice Lewis & Son, Toronto.
London Mach. Tool Co., Hamilton, Ont
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Williams & Wilson, Montreal.

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Canada Machinery Agency, Montreal.
Canadian Rand Co., Montreal.
Independent Pneumatic Tool Co., Chicago, Ill.
Rice Lewis & Son, Toronto.

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Rice Lewis & Son, Toronto.
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W. H. Petrie, Toronto.
Williams & Wilson Montreal

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American Tool Works Co, Cincinnati.
John Bertram & Sons Co., Dundas, Ont.
Bickford Tool & Drill Co., Cincinnati.
The Canadian Fairbanks Co., Montreal.
Rice Lewis & Son, Toronto
London Mach. Tool Co., Hamilton.
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.
Williams & Wilson, Montreal.

Drilling Machines, Suspension.
John Bertram & Sons Co., Dundas, Ont.
Canada Machinery Agency Montreal.
London Mach. Tool Co., Hamilton.
Niles-Bement-Pond Co. New York

Drilling Machines, Turret.
John Bertram & Sons Co., Dundas, Ont.
London Mach. Tool Co., Hamilton.
Niles-Bement-Pond Co., New York.

Drilling Machines, Upright.
American Tool Works Co., Cincinnati.
John Bertram & Sons Co., Dundas, Ont
Dwight Slate Machine Co., Hartford
Hamilton Tool Co., Hamilton, Ont.
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Rice Lewis & Son, Toronto.
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Drills, Bench.
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Eccentrically milled to prevent chatter. Accurately ground to the correct size. They cut free and leave a smooth surface.

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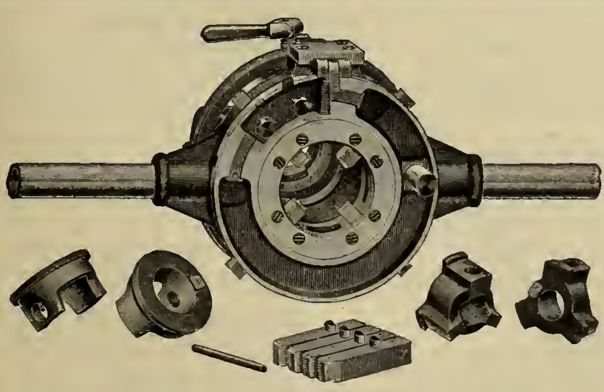

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Cleveland Twist Drill Co, Cleveland
Alexander Gibb Montreal.
Lewis, Rice & Son, Toronto.
Pratt & Whitney Co., Hartford, Conn.
Standard Tool Co., Cleveland, O.

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A. B. Jardine & Co., Hespeler, Ont.

Drills, Horizontal.

John Bertram & Sons Co., Dundas, Ont.
Canada Machinery Agency, Montreal.
Lewis, Ri e & son, Toronto.
London Mach. Tool Co., Hamilton.
Niles-Bement-Pond Co., New York.

Drills, Pneumatic.

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Canada Machinery Agency, Montreal.
Independent Pneumatic Too' Co., Chicago, New York
Niles-Bement-Pond Co., New York.

Drills, Radial.

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John Bertram & Sons Co., Dundas, Ont.
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Lewis, Rice & Son, Toronto
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Niles-Bement-Pond Co., New York.

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Cleveland Twist Drill Co., Cleveland
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Pratt & Whitney Co., Hartford, Conn.
Standard Tool Co., Cleveland.

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Canadian Rand Drill Co., Montreal.
Jeffrey Mfg. Co., Columbus, Ohio.

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Dwight Slate Machine Co., Hartford.
Lewis, Rice & Son, Toronto.
McKenzie, D., Guelph, Ont.
Niles-Bement-Pond Co., New York

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Alex. Gibb, Montreal.
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Standard Tool Co., Cleveland.

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Laurie Engine & Machine Co., Montreal.
John McDougall, Caledonian Iron Works Co., Montreal.
Robb Engineering Co., Amherst, N S.
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Gilson Mfg. Co., Guelph
The Goldie & McCulloch Co., Galt, Ont.
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Rice Lewis & Son, Toronto
H. W. Petrie, Toronto.
The Smart-Turner Mach. Co., Hamilton

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Dinning & Eckinstein, Montreal,
Jones & Glassco, Montreal

Engines, Steam.

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Belliss & Marcom, Birmingham, Eng.
Canada Machinery Agency, Montreal.
The Goldie & McCulloch Co., Galt, Ont.
Rice Lewis & Son, Toronto.
Laurie Engine & Machine Co., Montreal.
Gas & Electric Power Co., Toronto.
John McDougall Caledonian Iron Works, Montreal.
Robb Engineering Co., Amherst, N.S.
Sheldons Limited, Galt.
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Waterous Engine Works Co., Brantford.

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Jeffrey Mfg Co., Columbus, Ohio

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Canadian Westinghouse Co., Hamilton.
Gas & Electric Power Co., Toronto.
Sheldons Limited Galt, Ont.
The Smart-Turner Mach. Co., Hamilton.

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Detroit Foundry Supply Co., Windsor.
Dominion Foundry Supply Co., Toronto
Gas & Electric Power Co. Toronto
Hamilton Facing Mill Co., Hamilton.
Sheldons Limited, Galt.

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Laurie Engine & Machine Co., Montreal
John McDougall, Caledonian Iron Works Co., Montreal.
The Smart-Turner Mach. Co., Hamilton

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Shelton Metallic Filler Co., Derby Conn
Smooth-On Mfg. Co., Jersey City, N.J.

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Dominion Foundry Supply Co., Toronto
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Waterous Engine Works Co., Brantford.

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Dominion Foundry Supply Co., Toronto
Hyde, Fran is, & Co., Montreal.
Harbison - Walker Refractories Co., Pittsburg
Mau er, Henry, & Son, New York
Hamilton Facing Mill Co., Hamilton
Ontario Lime Association, Toronto
Pe n, Wm., Silica Works, Philadelphia, Pa.
Remmy. Richard C., Sons' Co., Philadelphia Pa.

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Maurer, Henry, & Son, New York

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Hamilton Facing Mill Co., Hamilton.
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Sheldons Limited, Galt, Ont.

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H. W. Petrie, Toronto.
St. Clair Bros, Galt
Wilson J. C. & Co, Glenora, Ont.

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Hamilton Steel & Iron Co.. Hamilton
Manitoba Iron Works, Winnipeg

Forging Machinery.

John Bertram & Sons Co, Dundas, Ont.
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London Mach. Tool Co., Hamilton, Ont
National Machinery Co., Tiffin. Ohio
Niles-Bement-Pond Co., New York.

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Niagara Falls Machinery & Foundry Co., Niagara Falls, Ont.
Richelieu Foundry Co, Sorel, Que.
The Smart-Turner Mach. Co., Hamilton.
Wilson J. C., & Co., Glenora, Ont.

Foundry Coke.

Baird & West, Detroit

Foundry Equipment.

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Dominion Foundry Supply Co., Toronto
Hamilton Facing Mill Co., Hamilton
Northern Engineering Works, Detroit

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Dominion Foundry Supply Co., Toronto
Partomol Co, New York
Stanley Doggett, New York
Swoboda, L. J., New York.

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Doggett, Stanley, New York
Dominion Foundry Supply Co, Toronto
Hamilton Facing Mill Co., Hamilton.
Smith, J. D., Foundry Supply Co., Cleveland, Ohio.

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Dominion Foundry Supply Co, Montreal
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Armstrong Bros. Tool Co., Chicago

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Gas & Electric Power Co., Toronto
Jones & Glassco, Montreal
Williams & Wilson, Montreal

Gauges, Standard.

Cleveland Twist Drill Co.. Cleveland
Pratt & Whitney Co., Hartford, Conn.

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Becker - Brainard Milling Mach. Co. Hyde Park, Mass.
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Dwight Slate Machine Co., Hartford.
Fellows Gear Shaper Co., Springfield, Vt.
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Lewis, Rice & Son, Toronto.
London Mach. Tool Co., Hamilton.
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.
Pratt & Whitney Co., Hartford. Conn.
Stevens Co, Galt, Ont.
Williams & Wilson. Montreal.
Wilson, J. C. & Co, Glenora, Ont.

Gear Hobbing Machines.

Gould, Eberhardt & Newark, N.J.

Gears, Angle.

Boston GearWorks Norfolk Downs, Mass.
Goldie & McCulloch Co., Galt, Ont.
Gould & Eberhardt, Newark. N.J.
Laurie Engine & Machine Co., Montreal.
John McDougall, Caledonian Iron Works Co., Montreal.
Waterous Engine Co., Brantford.
Wilson, J. C., & Co., Glenora, Ont.

Gears, Cut.

Boston Gear Works, Norfolk Downs, Mass
Goldie & McCulloch Co., Galt, Ont.
Gould & Eberhardt, Newark, N.J.
Horsburgh & Scott Co, Cleveland
New Process Raw-Hide Co., Syracuse, N.Y.
Wilson, J. C., & Co., Glenora, Ont.

Gears, Iron.

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Goldie & McCulloch Co., Galt, Ont.
Gould & Eberhardt, Newark, N.J.
New Process Raw-Hide Co., Syracuse, N.Y.
Wilson, J. C., & Co., Glenora, Ont.

Gears, Mortise.

Boston Gear Works, Norfolk Downs, Mass.
Goldie & McCulloch Co., Galt, Ont.
New Process Raw-Hide Co, Syracuse, N.Y.
Wilson, J. C., & Co.. Glenora. Ont.

Gears, Rawhide.

Goldie & McCulloch Co, Galt, Ont.
Horsburgh & Scott Co., Cleveland
New Process Raw-Hide Co., Syracuse, N.Y.

Gears, Reducing.

Boston GearWorks Norfolk Downs, Mass.
Goldie & McCulloch Co., Galt, Ont.
Gould & Eberhardt, Newark. N.J.
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Wilson, J. C., & Co., Glenora Ont

Gears, Worm.

Gould & Eberhardt, Newark, N.J.
Horsburgh & Scott Co., Cleveland
Wilson J. C., & Co., Glenora Ont.

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Allis-Chalmers-Bullock, Limited, Montreal
Canadian General Electric Co., Toronto
Canadian Westinghouse Co, Hamilton.
Gas & Electric Power Co., Toronto
Hall Engineering Works, Montreal.
H. W. Petrie, Toronto.
Toronto & Hamilton Electric Co. Hamilton.

Governors, Water Wheel.

Wilson, J. C., & Co., Glenora, Ont.

Graphite.

Detroit Foundry Supply Co, Windsor.
Doggett, Stanley, New York
Dominion Foundry Supply Co., Toronto
Hamilton Facing Mill Co., Hamilton.

Grinders, Automatic Knife.

Canadian Hart Wheels Ltd., Hamilton.
W. H. Banfield & Son, Toronto.

Grinders, Bench.

Canadian Hart Wheels L'd Hamilton.
McKenzie, D, Guelph, Ont.

Hall, J. H., & Sons, Brantford.
Lewis, Rice & Son, Toronto.

Grinders, Centre.
Canadian Hart Wheels Ltd., Hamilton.
Lewis, Rice & Son, Toronto.
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.

Grinders, Cutter.
Becker-Brainard Milling Mach. Co., Hyde Park, Mass.
Gould & Eberhardt, Newark, N.J.
Lewis, Rice & Son, Toronto.
Pratt & Whitney Co., Hartford, Conn.

Grinders, Disc.
Armstrong Bros. Co., Chicago

Grinders, Tool.
Armstrong Bros. Tool Co., Chicago.
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Gisholt Machine Co Madison, Wis.
Lewis, Rice & Son, Toronto.
H. W. Petrie, Toronto.
Williams & Wilson, Montreal.

Grinders, Pedestal.
Canadian Hart Wheels Ltd., Hamilton
Hall, J. H., & Sons, Brantford.

Grinding Holders.
Armstrong Bros. Tool Co., Chicago

Grinding Machines.
Bath Grinder Co., Fitchburg, Mass.
Canadian Hart Wheels Ltd., Hamiltoo.
The Canadian Fairbanks, Montreal.
Independent Pneumatic Tool Co., Chicago, Ill.
Rice Lewis & Son, Toronto.
Niles-Bement-Pond Co., New York.
Simonds Canada Saw Co., Montreal.
H. W. Petrie, Toronto.

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Canadian Hart Wheels Ltd., Hamilton.
Independent Pneumatic Tool Co., Chicago, Ill.
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.

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Carborundum Co., Niagara Falls
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Simonds Canada Saw Co,, Montreal
Williams & Wilson, Montreal.

Hack Saw Frames.
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Hammers, Belt Driven.
Beaudry & Co., Inc., Boston

Hammers, Drop.
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Ferracute Machine Co., Bridgeton, N.J.
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Niles-Bement-Pond Co., New York.

Hammers, Hand.
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Hammers, Power.
Beaudry & Co., Inc., Boston

Hammers, Steam.
Beaudry & Co , Inc., Boston
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London Mach. Tool Co., Hamilton, Ont.
Niles-Bement-Pond Co., New York.

Hammers, Trip.
Beaudry & Co., Inc., Boston

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A. B. Jardine & Co., Hespeler, Ont.

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Waterous Engine Co., Brantford.
Wilson, J. C., & Co., Glenora, Ont.

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Jeffrey Mfg. Co , Columbus, Ohio.
Niles-Bement-Pond Co., New York.
Northern Engineering Works, Detroit
The Smart-Turner Mach. Co., Hamilton.
Waterous Engine Co., Brantford.
Wilson, J. C., & Co., Glenora, Ont.

Hoists, Electric.
Northern Engineering Works, Detroit

Hoists, Pneumatic.
Canadian Rand Co., Montreal.
Dominion Foundry Supply Co., Montreal
Hamilton Facing Mill Co., Hamilton.
Northern Engineering Works, Detroit

Hoists, Portable & Stationary.
Canadian Pilling Co., Montreal

Hose, Air.
Canadian Rand Co., Montreal.
Canadian Westinghouse Co., Hamilton.
Independent Pneumatic Tool Co., Chicago

Hose Couplings.
Canadian Rand Co., Montreal.
Canadian Westinghouse Co., Hamilton.

Hose, Steam.
Allis-Chalmers-Bullock, Montreal.
Canadian Rand Co., Montreal.
Canadian Westinghouse Co., Hamilton.
Independent Pneumatic Tool Co., Chicago, Ill.

Hydraulic Accumulators.
Niles-Bement-Pond Co., New York.
The Smart-Turner Mach. Co., Hamilton.

Hydraulic Machinery.
Allis-Chalmers-Bullock, Montreal.
Gas & Electric Power Co., Toronto.
Wilson, J. C., & Co., Glenora, Ont.

Index Centers.
Stockbridge Mach'ns Co , Worcester, Mass.

India Oil Stones.
Norton Company, Worcester, Mass.

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L. S. Starrett Co., Athol, Mass.

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Canada Foundry Co., Toronto.
The Canadian Fairbanks Co., Montreal.
Rice Lewis & Son, Toronto.

Iron and Steel Bars and Bands.
Hamilton Steel & Iron Co. Hamilton

Iron Cements.
Detroit Foundry Supply Co., Windsor.
Dominion Foundry Supply Co., Montreal
Hamilton Facing Mill Co., Hamilton.

Iron Filler.
Detroit Foundry Supply Co., Windsor.
Dominion Foundry Supply Co., Toronto
Hamilton Facing Mill Co., Hamilton.
Smooth-On Mfg. Co., Jersey City, N.J.

Jacks.
Norton, A. O., Coaticook, Que.

Jigs.
Hall, J. H., & Sons, Brantford.
Scott, Ernest, Montreal.

Knives, Planer, Paper and Woodworking.
Whitman & Barnes Mfg. Co., St. Catharines, Ont.

Ladles, Foundry.
Dominion Foundry Supply Co., Montreal
Northern Engineering Works, Detroit
Smith, J. D., Foundry Supply Co., Cleveland, Ohio.

Lamps, Arc and Incandescent.
Canadian General Electric Co., Toronto.
Canadian Westinghouse Co., Hamilton.
Gas & Electric Power Co., Toronto
The Packard Electric Co., St. Catharines.

Lathe Dogs.
Armstrong Bros. Tool Co., Chicago
Pratt & Whitney Co., Hartford, Conn.

Lathes, Engine.
American Tool Work Co., Cincinnati.
John Bertram & Sons Co., Dundas, Ont.
Canada Machinery Agency, Montreal.
The Canadian Fairbanks Co., Montreal.
London Mach. Tool Co., Hamilton, Ont.
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.
Stevens Co., Galt, Ont.

Lathes, Screw Cutting.
Lewis, Rice & Son, Toronto
Niles-Bement-Pond Co., New York.

Lathes, Automatic, Screw-Threading.
John Bertram & Sons Co., Dundas, Ont.
London Mach. Tool Co., Hamilton, Ont.
Pratt & Whitney Co., Hartford, Conn.

Lathes, Bench.
Blount, J. G. & Co., Everett, Mass.
London Mach. Tool Co., London, Ont.
Pratt & Whitney Co., Hartford, Conn.

Lathes, Speed.
Blount, J. G., & Co , Everett, Mass.
Lewis, Rice & Son, Toronto.

Lathes, Spinning.
Bliss, E. W., Co., Brooklyn, N.Y.

Lathes, Turret.
American Tool Works Co., Cincinnati.
John Bertram & Sons Co., Dundas, Ont.
Blount, J. G. & Co., Everett, Mass.
Gisholt Machine Co., Madison, Wis.
Jones & Lamson Machine Co., Springfield, Vt.
Lewis, Rice & Son, Toronto.
London Mach. Tool Co., Hamilton, Ont.
Niles-Bement-Pond Co., New York.
The Pratt & Whitney Co., Hartford, Conn.
Stevens Co., Galt, Ont.
Warner & Swasey Co., Cleveland, O.

Link Belting.
Jeffrey Mfg Co., Columbus, Ohio.

Locomotives, Air.
Canadian Rand Co., Montreal.

Locomotives, Electrical.
Canadian Westinghouse Co., Hamilton
Gas & Electric Power Co., Toronto
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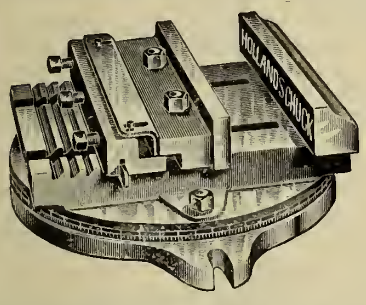

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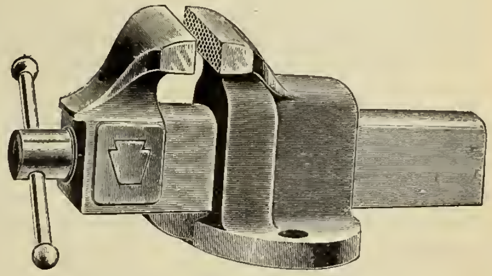

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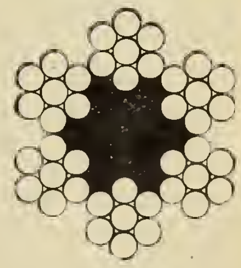

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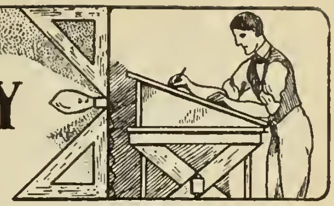

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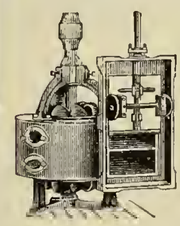

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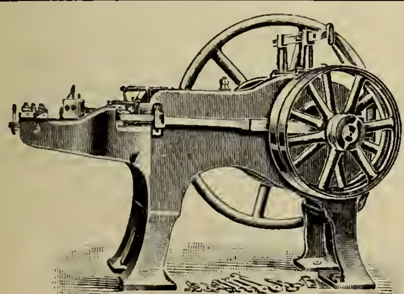

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Hamilton Facing Mill Co., Hamilton.

Saw Mill Machinery.

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Canada Machinery Agency, Montreal.
Fay, J. A., & Egan Co., Cincinnati
Goldie & McCulloch Co. Galt.
Jeffrey Mfg. Co., Columbus, Ohio.
Owen Sound Iron Works Co., Owen Sound
H. W. Petrie, Toronto.
Robb Engineering Co., Amherst, Ont.
Waterous Engine Works, Brantford
Williams & Wilson Montreal.
Wilson, J. C., & Co., Glenora, Ont.

Sawing Machines, Metal.

Niles-Bement-Pond Co. New York.

Saw Filing Machines.

Canadian Hart Wheels Ltd., Hamilton.

Saws, Hack.

Canada Machinery Agency, Montreal.
Detroit Foundry Supply Co., Windsor
London Mach. Tool Co., Hamilton
Rice Lewis & Son, Toronto.
McKenzie, D., Guelph, Ont
Simonds Canada Saw Co., Montreal.
L. S. Starrett Co., Athol, Mass.

Screw Cutting Tools

Canadian Tap & Die Co., Galt.
Hart Manufacturing Co., Cleveland, Ohio
Jardine, A. B., & Co., Hespeler, Ont.

Screw Machines, Automatic.

Canada Machinery Agency, Montreal.
London Mach. Tool Co., Hamilton, Ont.
National-Acme Mfg. Co., Cleveland.
Pratt & Whitney Co., Hartford, Conn.

Screw Machines, Hand.

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A. B. Jardine & Co., Hespeler.
London Mach. Tool Co., Hamilton, Ont.
Pratt & Whitney Co., Hartford, Conn.
Warner & Swasey Co., Cleveland, O.

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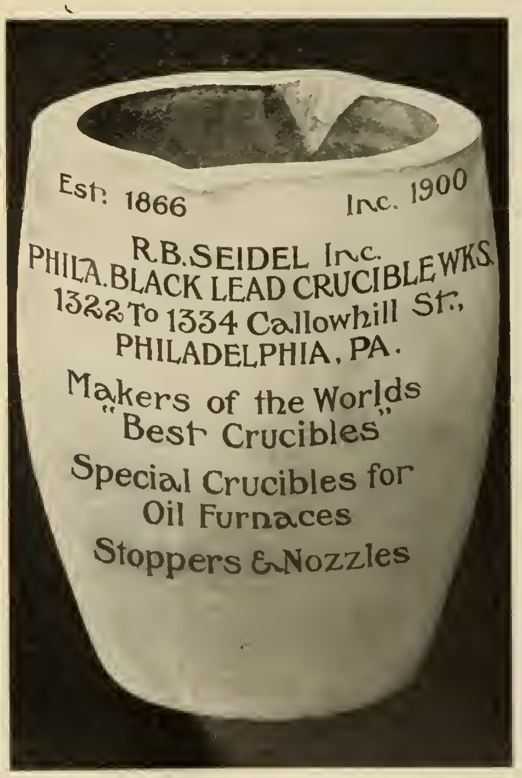

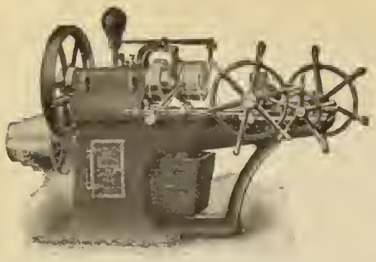

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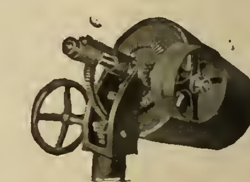

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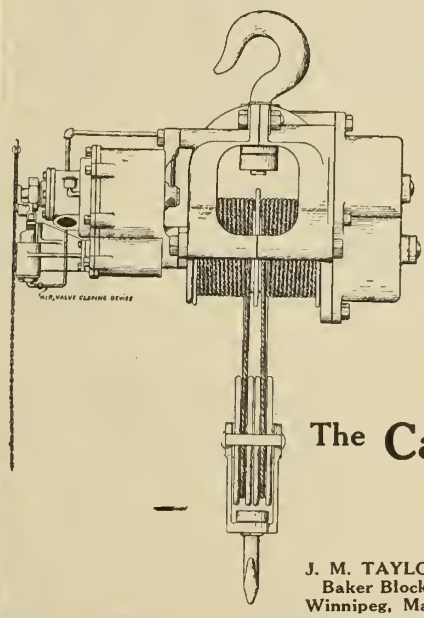

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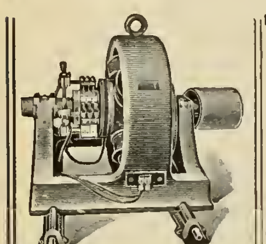

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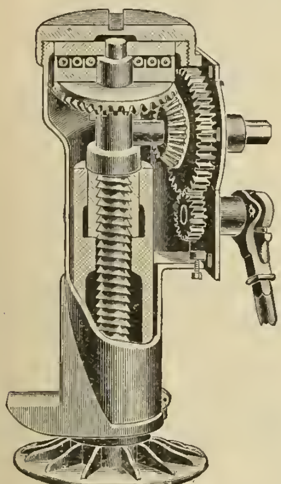

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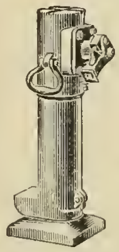

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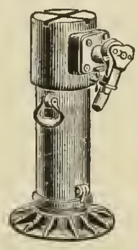

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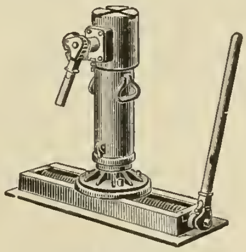

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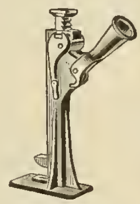

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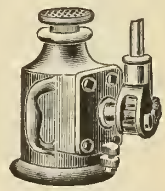

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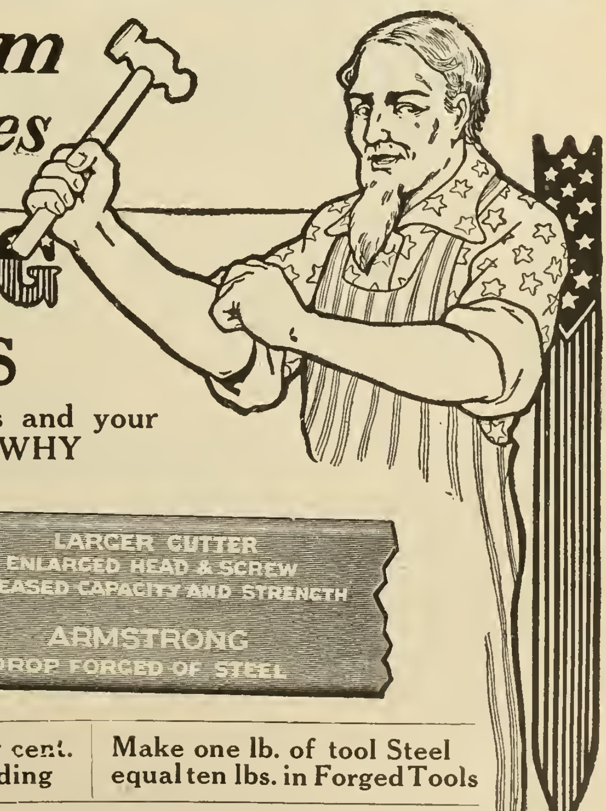

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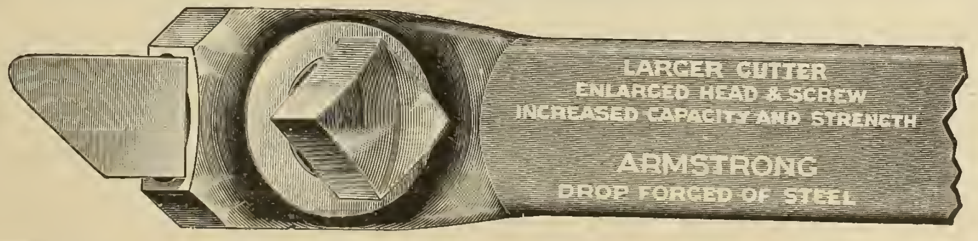

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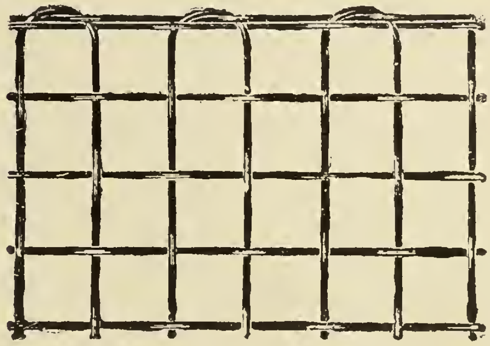

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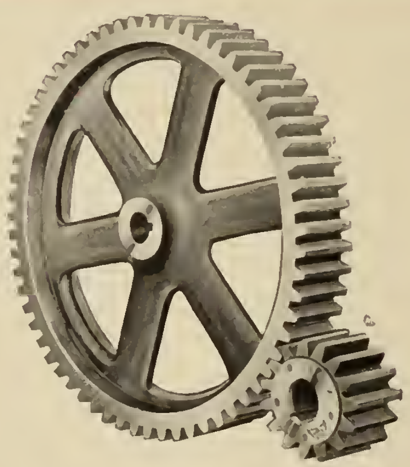

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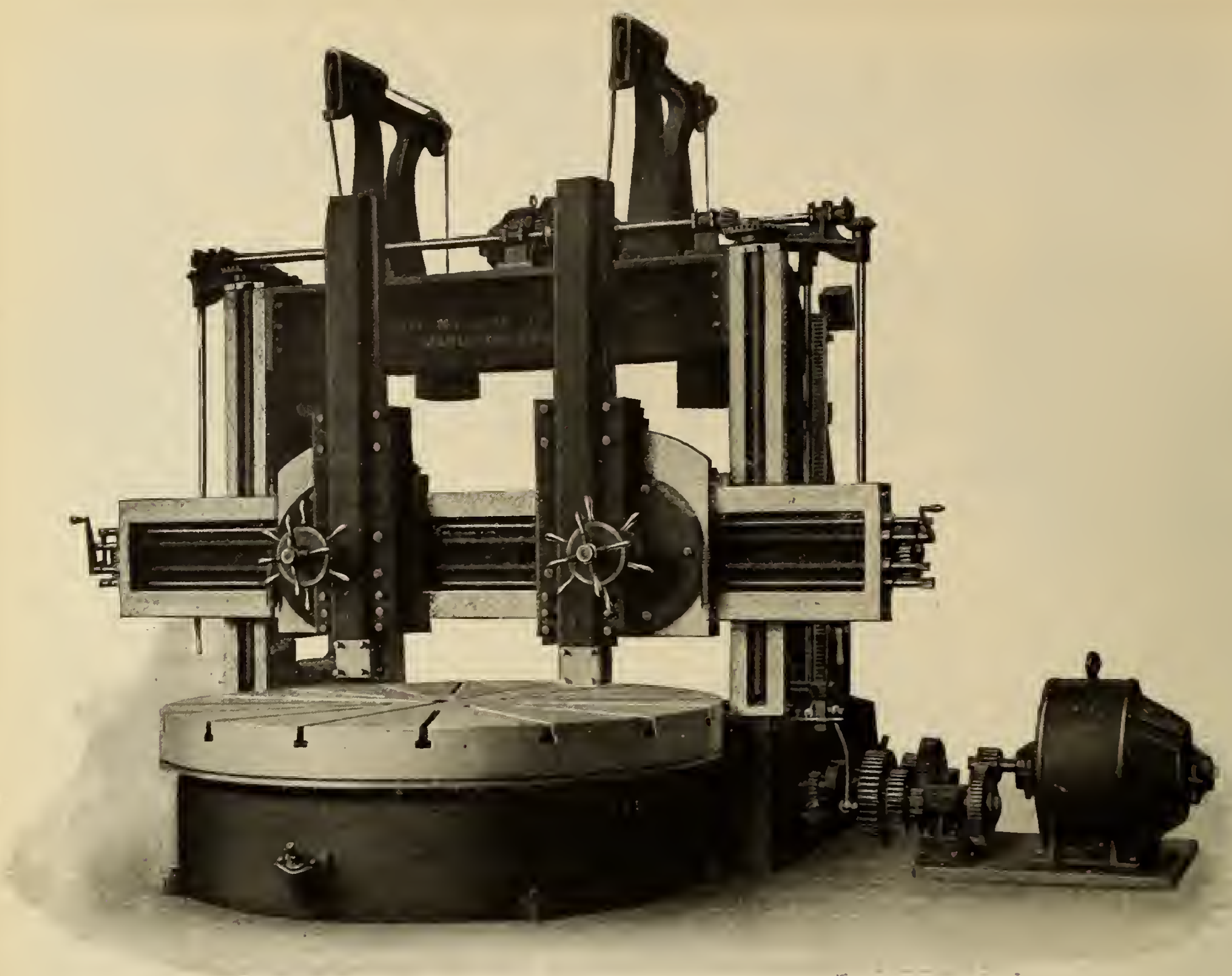

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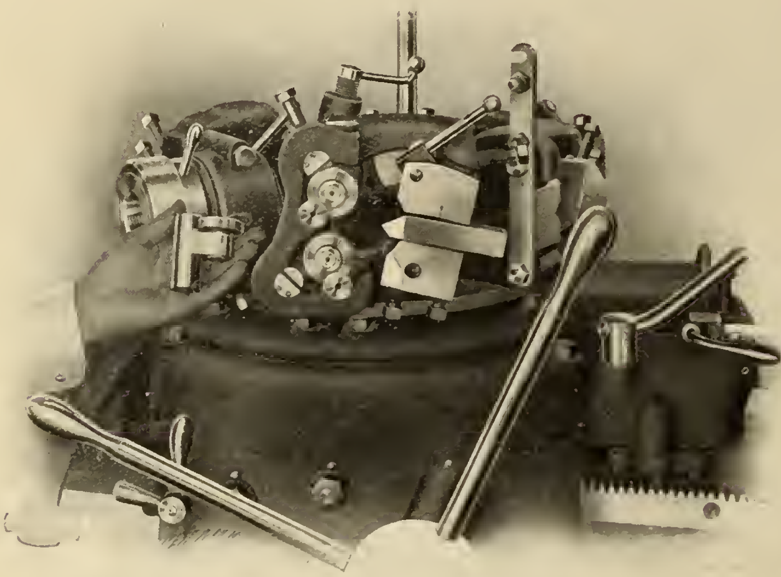

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Its rolls run on straight headless pins hardened and ground. These pins are held by a rocker insuring an axis, in parallelism with work.

All adjustments are conveniently made and are the most direct and unyieldingin resistance of working strains.

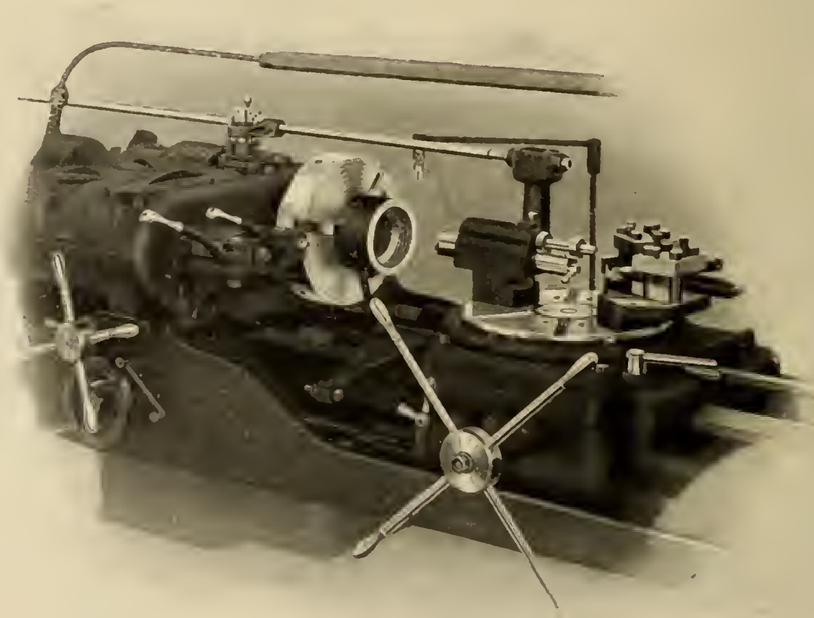
The Cross Feeding Head Flat Turret Lathe is now built in two sizes: 2 x 24,--- 12 inch swing, and 3 x 36,---14 inch swing.

AUTOMATIC SCREW CHASING TOOL

This cut shows the chasing tool in working position (some of the other tools have been removed to give a fuller view).

It cuts screws of any diameter from 11½ down to 2¼ inches in diameter for internal screws and about 1 inch for external threads, and any length under 4 inches.

The great advantage of this attachment is in its producing a screw thread which is known to be absolutely true with the other cuts that have been taken at the same setting, and notwithstanding its rapid operation its accuracy exceeds the product of the average engine lathe.



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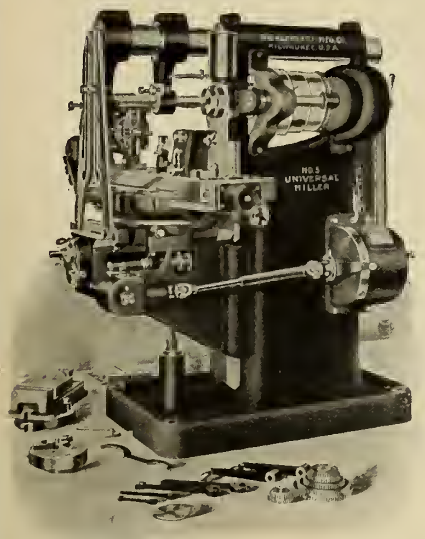
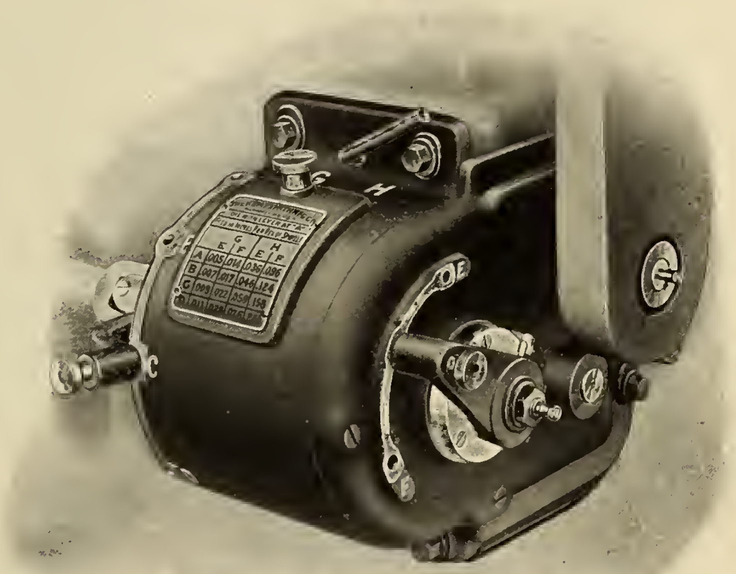
have a geared feed mechanism which provides 16 changes entirely through spur gears in one box only, all obtainable while machine is operating under cut.





This very important feature is only one of the many points of high development on these machines.

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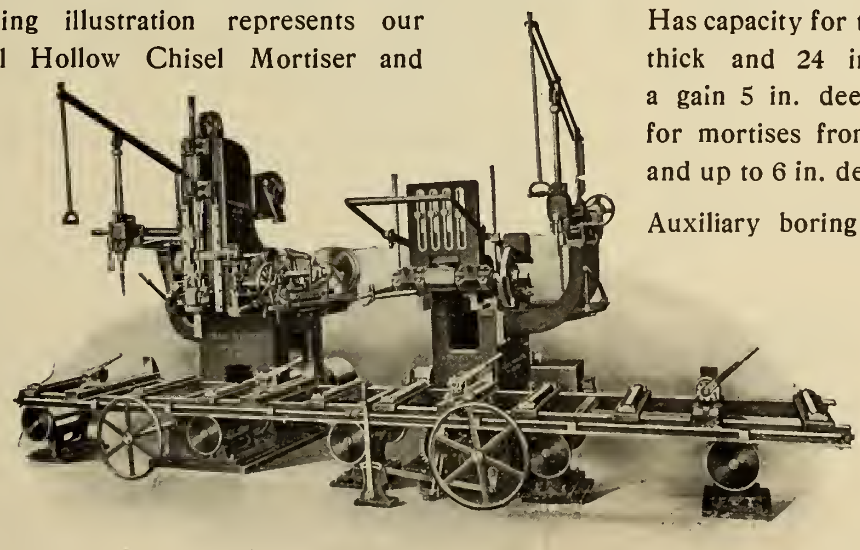
A COMBINED MORTISER and GAINER

The accompanying illustration represents our No. 214 Vertical Hollow Chisel Mortiser and No. 150 Automatic Car Gainer used as one machine with a traveling table between them. This facilitates the handling of heavy timbers which have to be both mortised and gained.



Combination No. 214 Vert. Hollow Chisel Mortiser and No. 150 Aut. Car Gainer.

Has capacity for timbers up to 20 in. thick and 24 in. wide, will cut a gain 5 in. deep. Has capacity for mortises from ½ to 3 in. square and up to 6 in. deep.

Auxiliary boring attachments angle 30 degrees in either direction. The two spindles have a vertical stroke of 18 in. and a lateral adjustment of 18 in.

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One new 22"x12' Lodge & Shipley.
One new 22"x12' Lodge & Shipley. (double back geared).
One nearly new 22"x8' London.
One nearly new 19"x12' Rahn Carpenter.
One new 19"x10' Greaves Klusman
One new 19"x8' Greaves Klusman.
One new 18"x8' Rahn Carpenter.
One refitted 18"x8' back geared.
One refitted 18"x6' back geared.
One new 16"x10' Rahn Carpenter.
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One new 16"x6' Rahn Carpenter.
One new 15"x6' London.
One new 14"x6' Sebastian.
One refitted 14"x6' Sebastian.
One refitted 13"x4½' back geared.
One new 12"x8' Champion.
Three refitted 12"x6' back geared.
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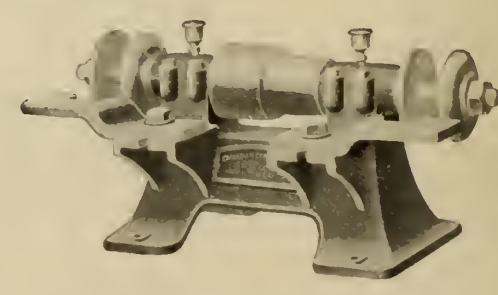

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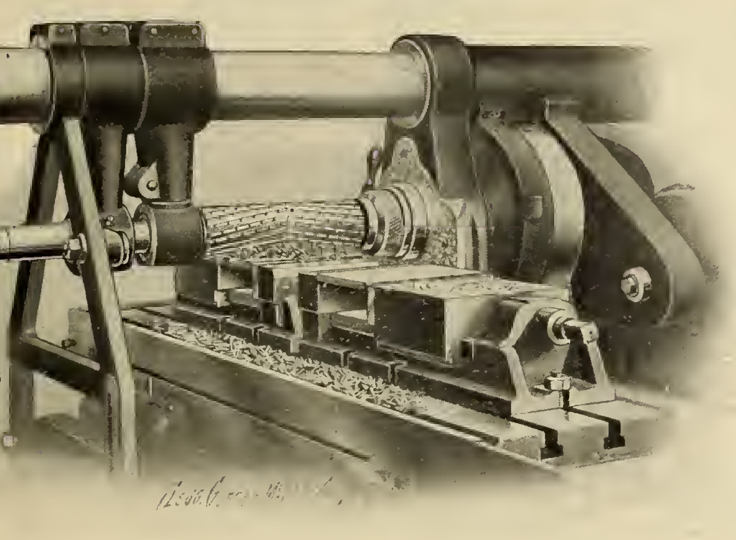

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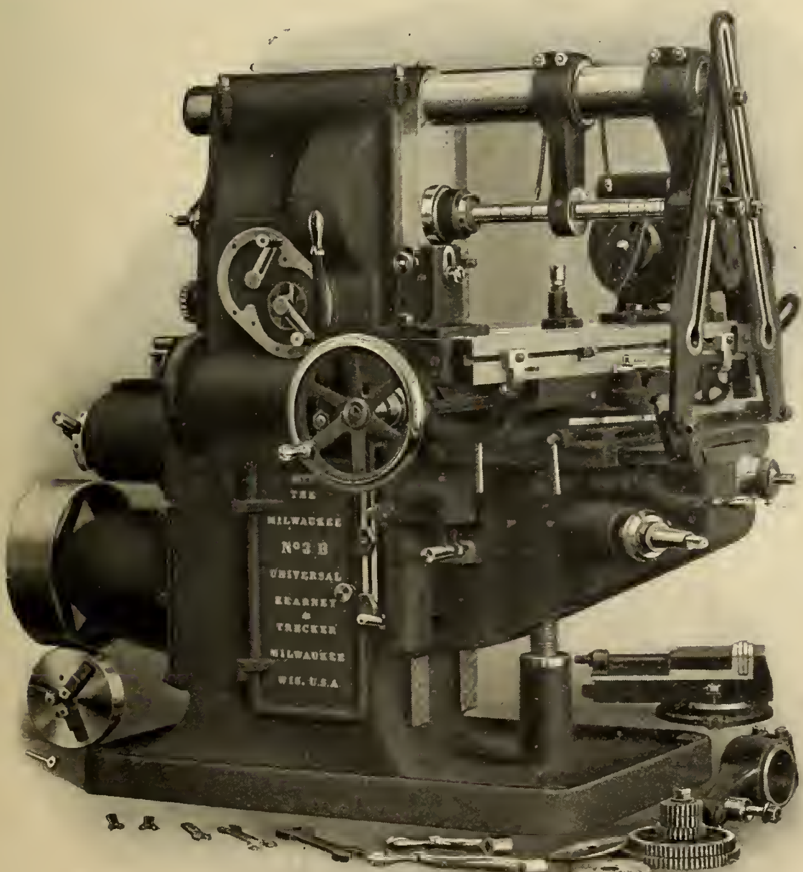

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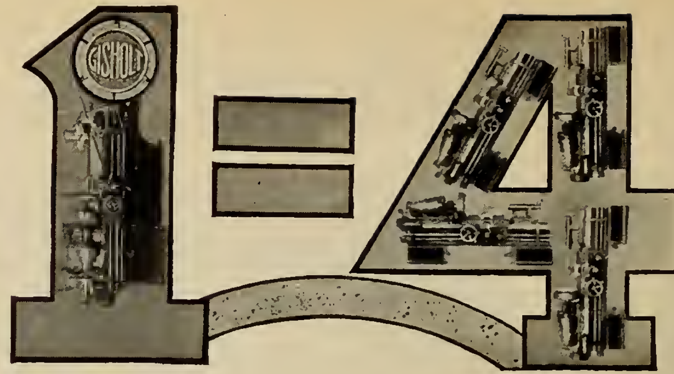

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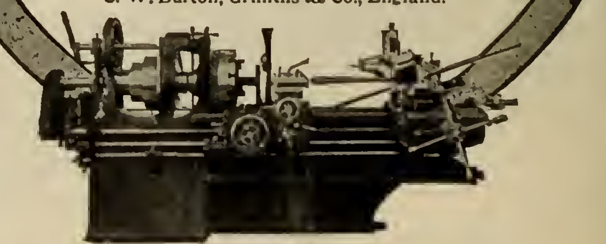

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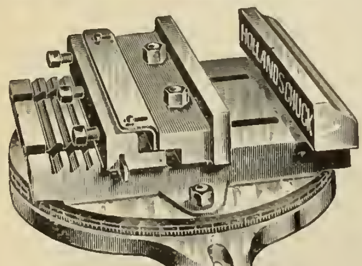

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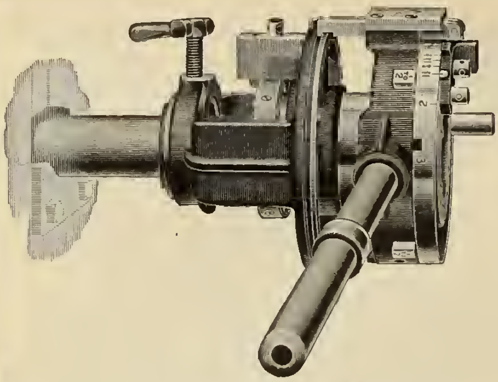

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With a Beaver Die Stock you can thread four sizes of pipe without changing dies. Think of the time saved! No hunting for misplaced dies. The Beaver can be adjusted from one size to another in a few seconds. It cuts easier and wears longer than any other die stock on the market. You can't strip threads when you use a Beaver because the dies are released when backing off. Let us ship you a Beaver for

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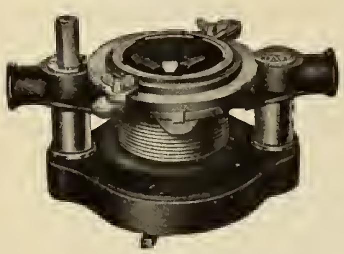
If it isn't up to what we claim it we'll take it back without charging you a cent.



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Weighs 75 lbs.

Rear view showing gears—
They are incased.

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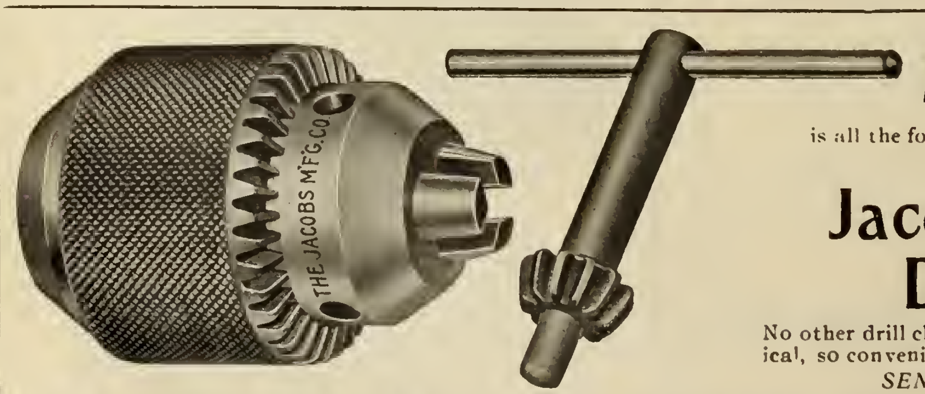

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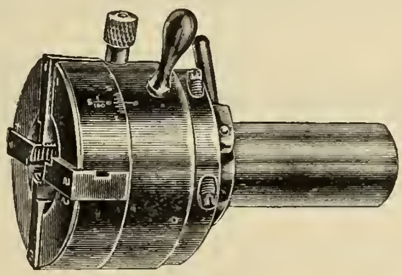

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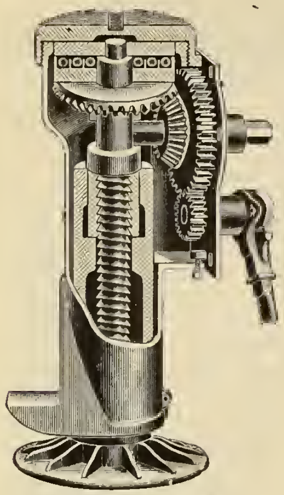
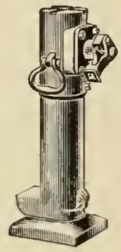
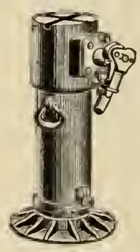


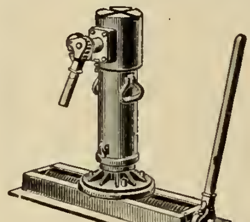
Sectional View of 70-Ton Bridge Jack



25-Ton Foot Lift Jack



35-Ton Plain Jack



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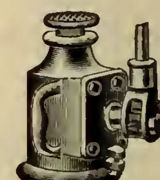

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It's easy to make a ratchet drill with a LONG HEAD and a long feed or a short head and a SHORT FEED but this is the ratchet with a SHORT head and a LONG feed.

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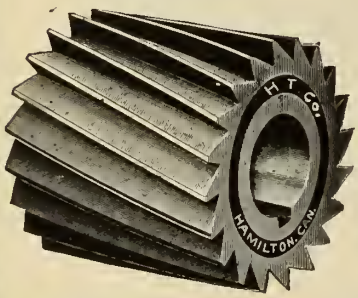

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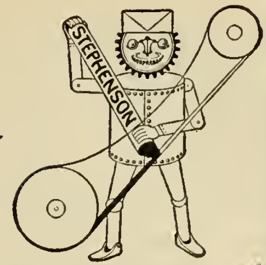

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Telescopic Spout

Specially adapted for varying heights of Tenders

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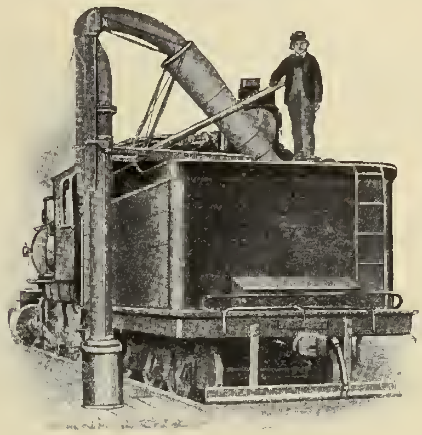

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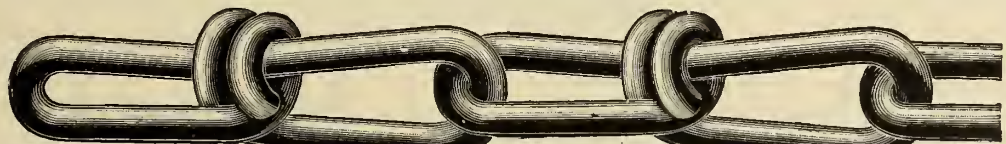

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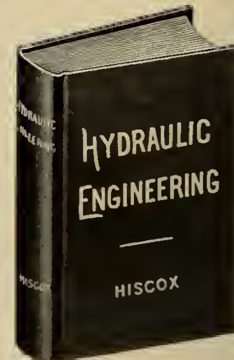

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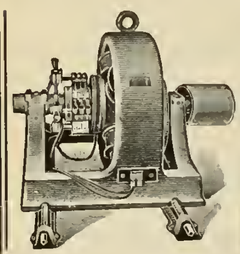

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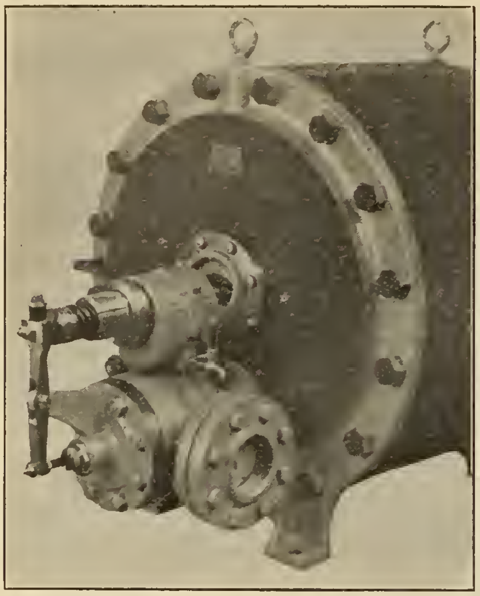

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Ready for quick delivery,
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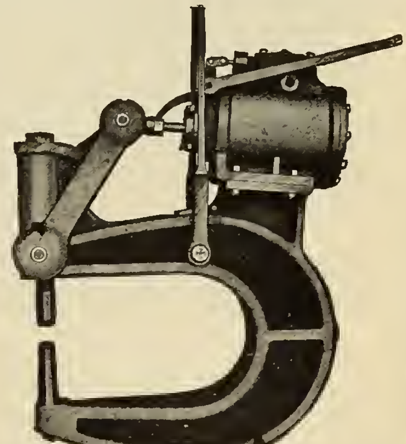

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It creates profit out of what would be otherwise lost energy.

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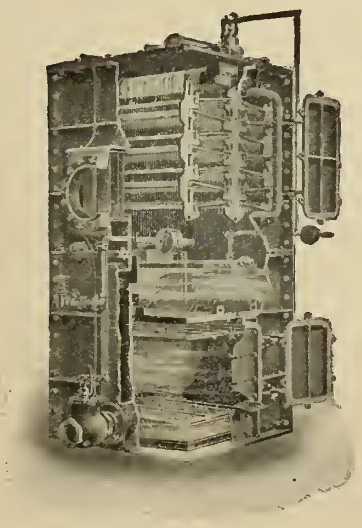

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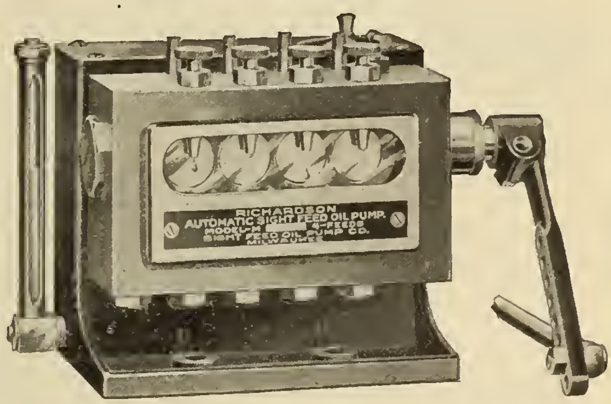

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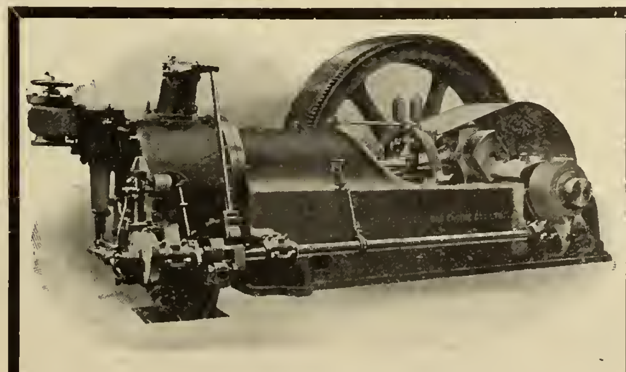

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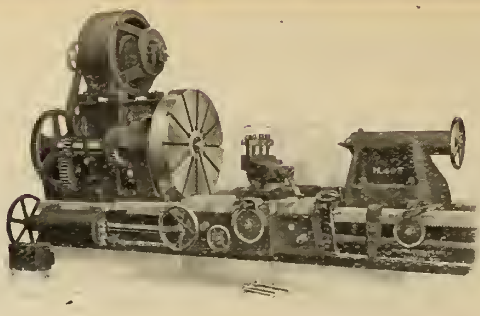

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Lathes of all Sizes—

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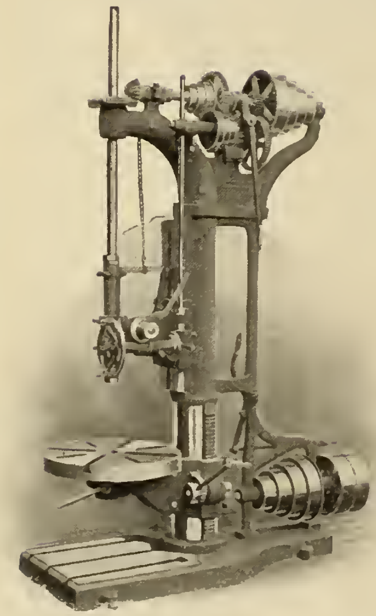

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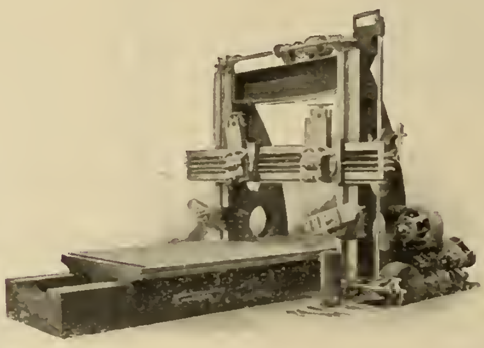

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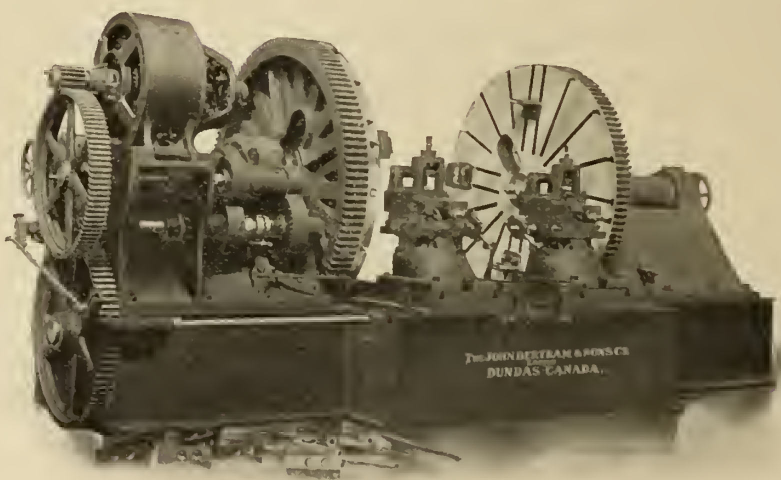

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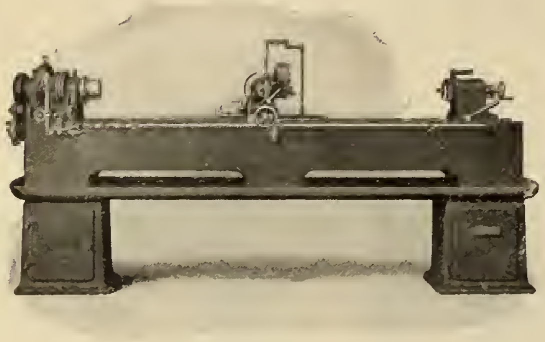

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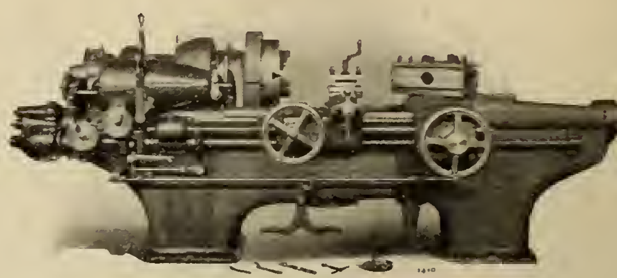

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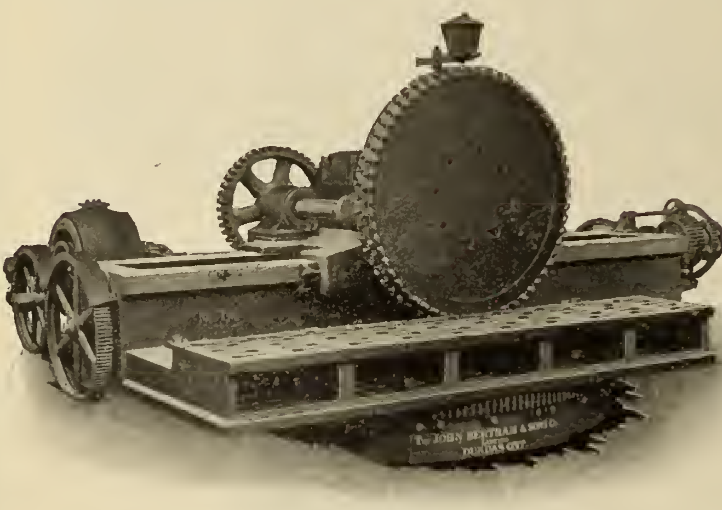

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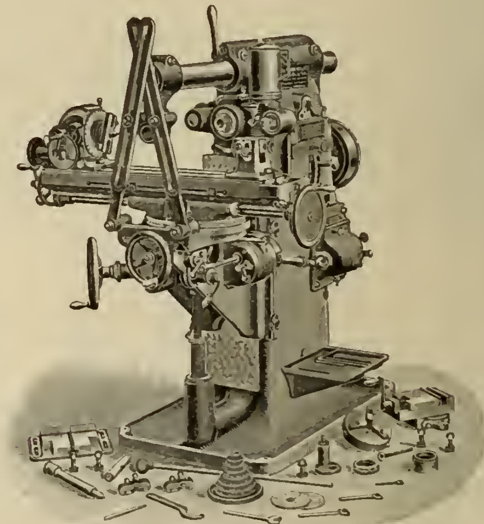
MOTOR DRIVEN

Mounted on circular base arranged to swivel for facing work at any angle. Other types and sizes.



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PRATT & WHITNEY SMALL TOOLS

MADE IN DUNDAS, ONT.

Taps, - Dies, - Reamers, - Milling and Other Cutters, - Lathe Tools, - etc.

The Canadian Fairbanks Co., Ltd.

MONTREAL

Toronto St. John Winnipeg Calgary Vancouver

Somerville Brass Plant: One of the Finest on the Continent

A Plant Up to Date and Convenient in Every Way; Features of Particular Interest; Superintendent's Office and Welfare System for Employees.

The new brass plant of Somerville Limited, Toronto, is representative of the best modern factory construction and equipment. A brass plant, where there are so many separate departments, is a difficult plant to design so as to have the whole plant a unit, and yet have each department separate as it should be. Yet in this plant this has been accomplished with remarkable success. The features for inter-department communication are excellent, and shipping facilities very convenient. The lighting is splendid, even to the low ceiling basement. The use of wire partitions where feasible, for instance, between the machine shop and tool room, between the machine shop and pattern shop, and between the foundry and the core room, facilitates good lighting. Glass is used where a more effective partition than wire is required, as between the plating room and the shipping room, and between the plating room and the polishing and buffing room.

The plant consists of the main building, 60 by 175 feet, with a wing 30 by 50 feet, and a foundry 50 by 100 feet. The main building is of slow burning mill construction, but the foundry is of steel construction. Limestone brick is used throughout. Between these main departments are fire doors and wire glass partitions. The main building is two storeys in height at present, but the roof construction is such as to allow jacking up for the addition of another storey when necessary. Thus ample provision is made for upward extension in the main building and the foundry can be extended at the rear end.

Fig. 1—A General View of the Foundry, Showing Furnaces in Background.

On the first floor of the main building the office, shipping room and polishing and buffing room are located. In the second storey are the machine shop, the tool room, the pattern shop and the superintendent's office. In the basement are situated the conveniences for the employes, which constitute a feature in themselves which will be discussed later.

Heating and Ventilation.

The heating, ventilating and artificial lighting are along the most up-to-date and efficient lines. The plant is heated most effectively with the exhaust steam from the engine. The heating is on the plenum system, air being taken from outside, drawn through steam pipes, through which is passed the exhaust steam, and discharged by the 72-inch fan into galvanized pipes running to all parts of the plant. The steam coils are arranged in sections in order that the heat may be regulated without altering the volume of air. In summer the exhaust steam is cut off and the fan used for ventilating purposes only. The system is most efficient, giving a complete change of air every three minutes.

All electric wiring throughout the plant is enclosed in iron conduits, which

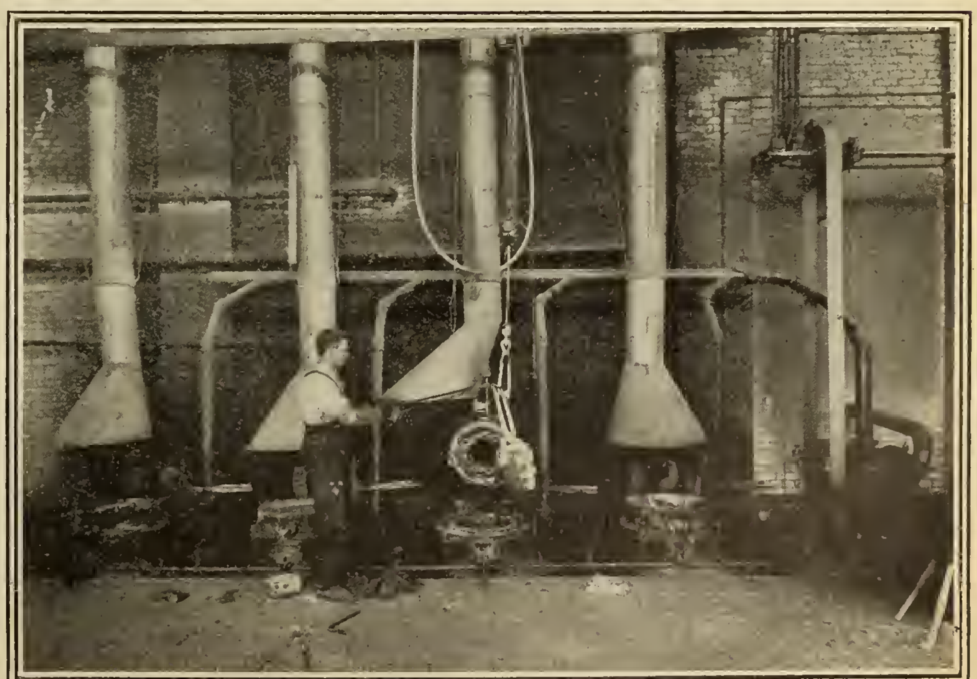


Fig. 2—View of Oil Furnaces in the Foundry, A Crucible Being Handled.

together with the other fireproof features, allow a very low insurance rate.

Modern Brass Foundry.

The correct way to see a plant is to follow the raw material through the various processes to the finished material. The railway siding runs right into the centre of the plant, convenient to the shipping room, the store room, the foundry and the power plant. The manufacture, however, really starts in the foundry. Fig. 1 is a general view of the foundry showing the molding floor in the foreground, and the oil furnaces in the background. The stock room, for raw metals, is also shown in the far end of the foundry, which is kept locked. The door shown opens to the receiving platform on the railway siding. Fig. 2 gives a close view of the four crude oil furnaces made by the Fisher Crucible Furnace Co. The illustrations show the crucible being removed from one of the furnaces by pneumatic hoist. The crude oil is stored in an 8,000-gallon tank in the yard. To the right of the illustration can be seen a Dodge & Stacey blower for the furnaces. The hoods over the furnaces to remove the fumes were installed by W. E. Dillon Co., Ltd., Toronto, as were also the hot blast conduits in the heating system, and the exhaust conduits in polishing and budding room.

With these oil furnaces seven or eight heats per day can be taken, whereas with coke furnaces only three or four heats are possible. Oil furnaces are also much cleaner, and have here been found to be much more economical.

This company make all their own patterns and mount them, using both metal and wood patterns. The pattern room is shown in Fig. 3, which is partitioned off from the machine shop by wire netting. For storing patterns, the plant is equipped with a large pattern vault 20 by 12 feet, and also a smaller one. These vaults are, of course, absolutely fireproof.

The molding floor is equipped with a Tabor molding machine, which is being thoroughly tested out, and more machines will be installed later, if this one is found to do good work.

Other foundry equipment includes Hanna Engineering Co.'s pneumatic shakers and squeezer, sprue cutter and Todd tumbling barrel.

The floor of the foundry consists of 4 inches of concrete with 1 inch of sand and vitrified brick on edge.

Fig. 4—Section of Core Room, Showing Splendid Lighting.

Fig. 3—The Pattern Room Adjoining the Tool Room.

Well Lighted Core Room.

At the south end of the foundry is the core room, partitioned off from the foundry by wire screens. The demand for cores in a brass foundry making plumbers' supplies, is very large, and this accounts for the large and well-equipped core room, sections of which are illustrated in Figs. 4 and 5. To the left of Fig. 5 is seen a car load of the cores.

The core oven shown in the same figure was supplied by the J. D. Smith Foundry Supply Co., Cleveland, O., a feature of this oven is that as the trays are pulled out, the back of the tray shuts off the furnaces, thus preventing loss of heat.

In Fig. 4 the core makers are seen at their benches. All the cores used in this foundry are intricate, and, therefore, no core machine can be utilized.

Machine Shop and Tool Room.

The castings go from the foundry to the machine shop by means of an electric hoist operated by induction motor. This elevator has a fireproof shaft, and was installed by the Otis-Fensom Elevator Co. Convenient to the elevator is situated the machine shop store room, which is partitioned off from the machine shop by wire screen. This room is equipped with a Fairbanks multiple computing scale, by which the small castings are counted by weighing, that is, one of the castings is placed in one

Fig. 5—View of Core Room, Showing Core Oven in Background.

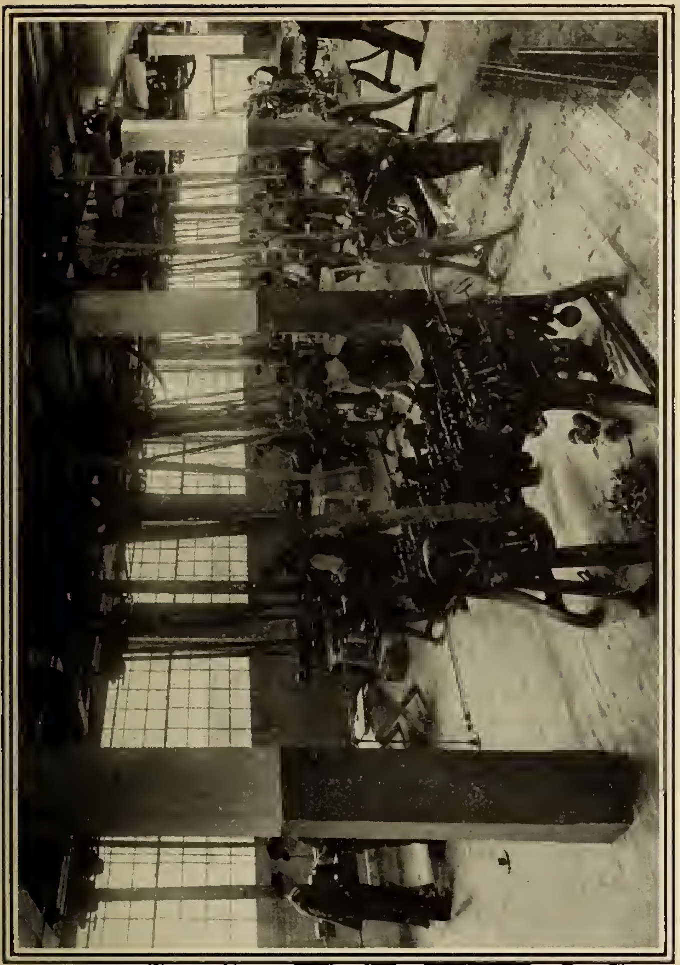


Fig. 6—The Well Equipped Brass Finishing Room.

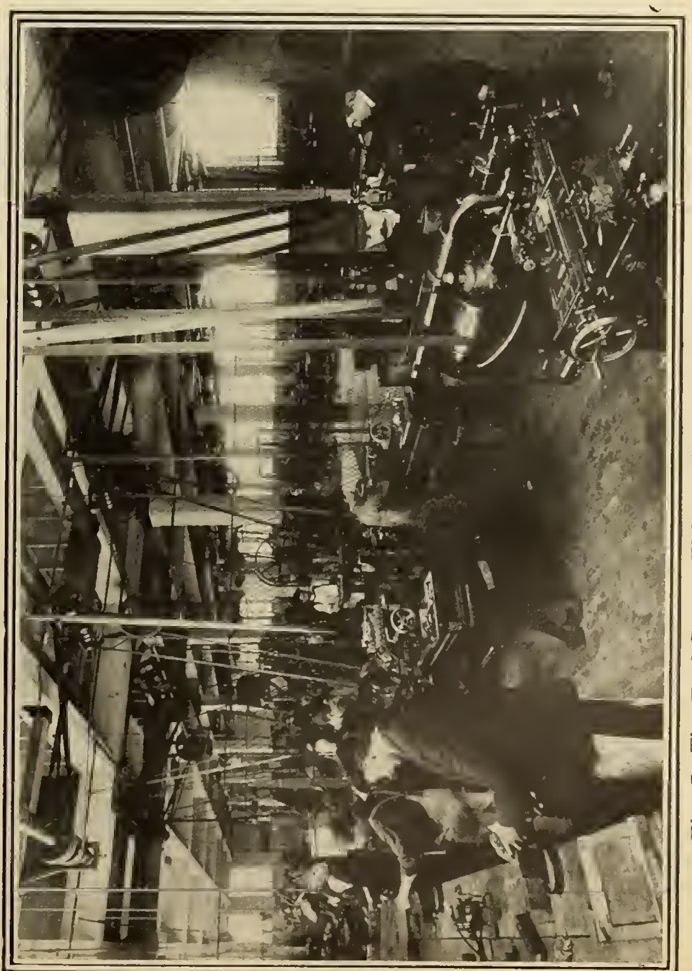


Fig. 7—The Tool Room, Well Equipped With Modern Machinery.

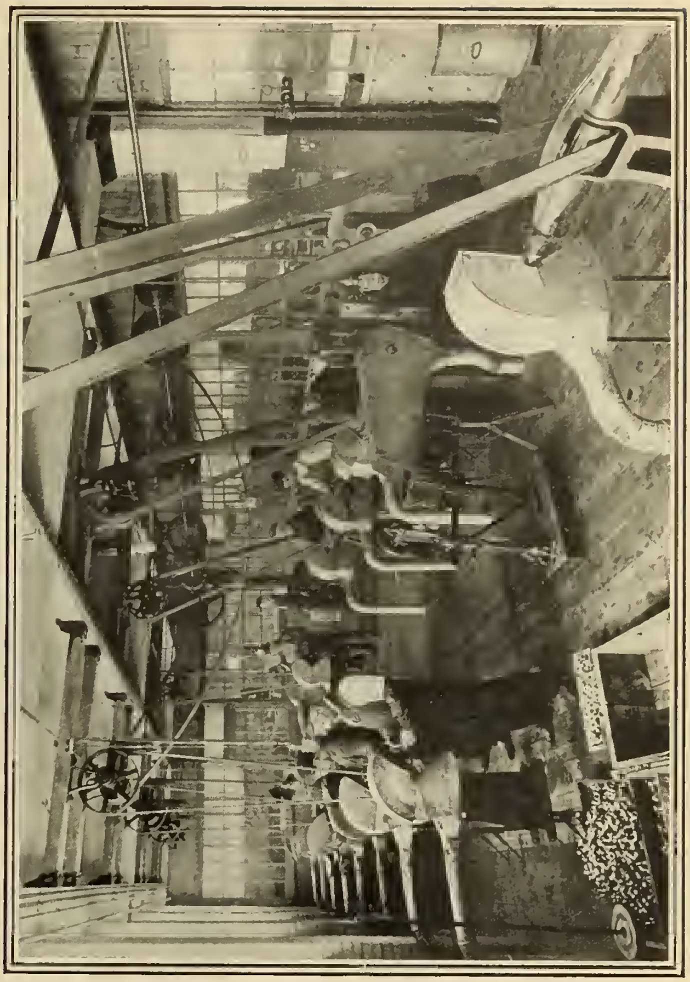


Fig. 8—The Polishing Room, With Most Efficient Equipment.

of the pans, and in the other the same castings are put until the two pans balance. A certain weight ratio exists between these two pans, and thus the castings are counted. The accuracy of this method of computing depends, of course, upon whether each casting weighs the same.

The machine shop or brass finishing room, as it is called, is equipped with a complete line of Warner & Swasey brass finishing lathes, which are shown in Fig. 6. In the foreground of this illustration is seen a six-tap grinding machine for grinding seats of cocks. This machine was built by the Milwaukee Grinding Machine Co. Other equipment of the brass finishing room includes a Warner & Swasey double head keyway machine, and a valve milling machine for milling the hexagon part of valves, built by the American Tool & Machine Co.

All the tools used in the plant are made in the tool room, shown in Fig 7, including even taps, etc. This necessitates a well-equipped tool room. The equipment includes a Kearney & Trecker universal milling machine, two Flather tool room lathes, a Flather shaper, a Lodge & Davis Machine Tool Co.'s drill, a J. Stevens Co. universal grinder, hack saw, etc.

Polishing and Plating Rooms.

The polishing room shown in Fig. 8 is a thoroughly up-to-date and efficient one. In fact, so efficient is the exhaust system for removing dust from the machines, and the system of ventilating, that the air is quite as fresh and clean as in any part of the building. That is something to say about a brass polishing room. In the illustration the exhaust heads at each polishing and buffing machine can be seen. All these small pipes lead to the main exhaust pipe in the basement. The air from this main pipe exhausts into a cyclone receiver outside the building, in which a good deal of metal is recovered.

Fig. 10—Superintendent's Office, a Feature of the Plant.

The plating room is shown in Fig. 9. It is equipped with a 14-ft. tank, and thus is capable of plating work of greater length than most plating rooms. The plating dynamo was supplied by Hanson & Vanwinkle.

Fig. 9—The Plating Room, Containing a 14-ft. Tank.

On the same floor as those two departments is the warehouse, stock room for tubing, and the shipping room.

A distinct feature of this plant is the superintendent's office, shown in Fig. 10. This office is situated on the second floor of the main building, and is glass on three sides. On one side the superintendent can command a full view of the machine shop, tool room, and the pattern room, as shown in the illustration, and from the other side he can see everything going on in the foundry and core room. The third glass side affords a view outside to the shipping and receiving platforms.

Carrying out the same idea, the main office has a glass partition to the warehouse, and thus from the office a view is had of practically all the lower floor.

From the two offices the entire plant can be watched with the exception of the engine and boiler room.

Engine and Boiler Room.

The engine room, Fig. 11, is equipped with a 200 h.p. Corliss low speed Robb-Armstrong engine, direct connected to a 175 k.w., 600 volt, Allis-Chalmers-Bullock alternator. The line shafting in the various departments is operated by Allis-Chalmers-Bullock 500 volt induction motors. The lighting is done with arc and incandescent lights on the three-wire system, current from the alternator being transformed to 110 and 220 for that purpose. The switch board consists of two panels, one for power and the other for the lighting. The engine room also contains a motor-driven Canadian Rand compressor, supplying the air used in the foundry and elsewhere.

The boiler room is equipped with two Robb boilers, and a feed water heater. A

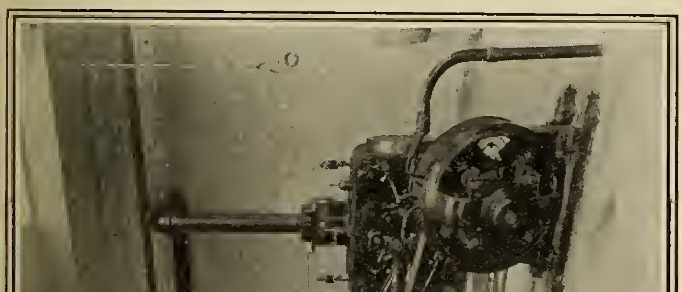


Fig. 11—Engine Room, Showing Corliss Engine Direct Connected to Alternator.

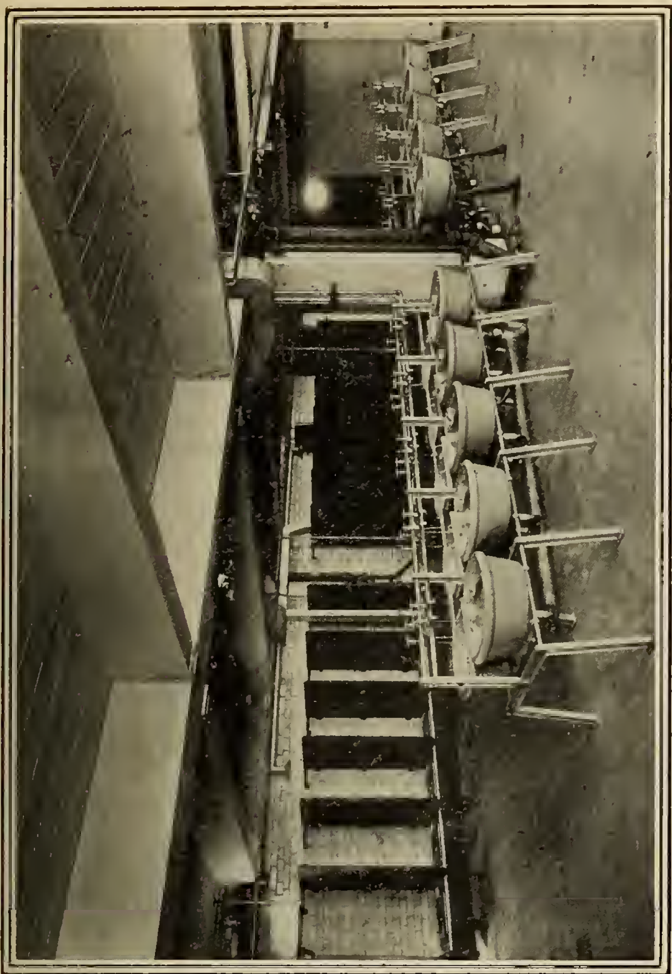


Fig. 12—The Employes' Wash Room, Containing Solid Porcelain Conveniences.

Fig. 13—Another view of the Employes' Lavatory, Showing the Shower Baths.

Fig. 14—The Locker Room Contains a Wire Locker for Each Employe.

feature of the engine room is that the end of the room opposite the front of boilers is open to the outside air, the opening being closed with a corrugated iron door, raised or lowered with chain and sprocket wheel. This makes the boiler room very pleasant in summer.

Welfare of Employes.

There are very few plants in which the welfare of employes has been given so much attention as in this plant. Their health and convenience have been provided for on every hand. In the matter of heating, ventilating and lighting, the plant is ideal. Pure, fresh air and good light are necessary to the best working efficiency. Figs. 12, 13 and 14 show what has been provided in the way of wash room, shower baths, and lockers for clothes. Every care has been taken to make the wash room strictly sanitary. It contains solid porcelain wash basins, range closets and urinals. Urinals are also provided in other parts of the plant. Hot and cold water are available at all hours of the day for the showers. As seen in the illustration, the showers have not been completed; partitions between the showers having still to be put up. The locker room contains a locker for each employe.

Whether these features for the welfare of the employes will be taken advantage of to a full extent, has not been tested out as yet.

In this plant a complete line of plumbers' and steamfitters' supplies are manufactured, as well as lead pipe, lead bends and solder. The land, building and equipment cost approximately $200,000. It is probably one of the finest plants on the continent.

Aside from this large brass plant of which Mr. F. L. Hazeldine is superintendent, the company maintains a large warehouse and offices on Richmond and Lombard Streets, Toronto, of which Mr. Fred Somerville, general manager, of the company, has charge.

FINISHING CROSS HEAD PINS.

The following is a description of the method of finishing cross head pins on the special railroad lathe which has been brought out by the Gisholt Machine Co., Madison, Wis., known as the Gisholt Big Bore Lathe, this machine being adapted to such work as liners, brasses, pistons, piston centres, front and back cylinder heads, piston followers, bull rings, eccentrics and strap rings, cross heads, pipe flanges, steam chest covers, and work off the bar such as cross head pins, valve motion pins, brake hanger pins, etc. As compared with other methods, work of these two general classes may be finished in lots of as few as six or eight of a kind at a time with a result in saving of from 50 to 80 per cent. and upwards. Naturally the bringing out of this machine has caused a considerable revision of production methods in many of the railroad shops.

To give a general idea of the method of finishing work from the bar a description is herein given of finishing a cross head pin on the Gisholt Big Bore Lathe with 5-inch spindle hole.

The piece of bar stock is shown at "A" and is held in the three-jawed scroll chuck by hard chuck jaws at "B" and also by three chuck blocks at "C."

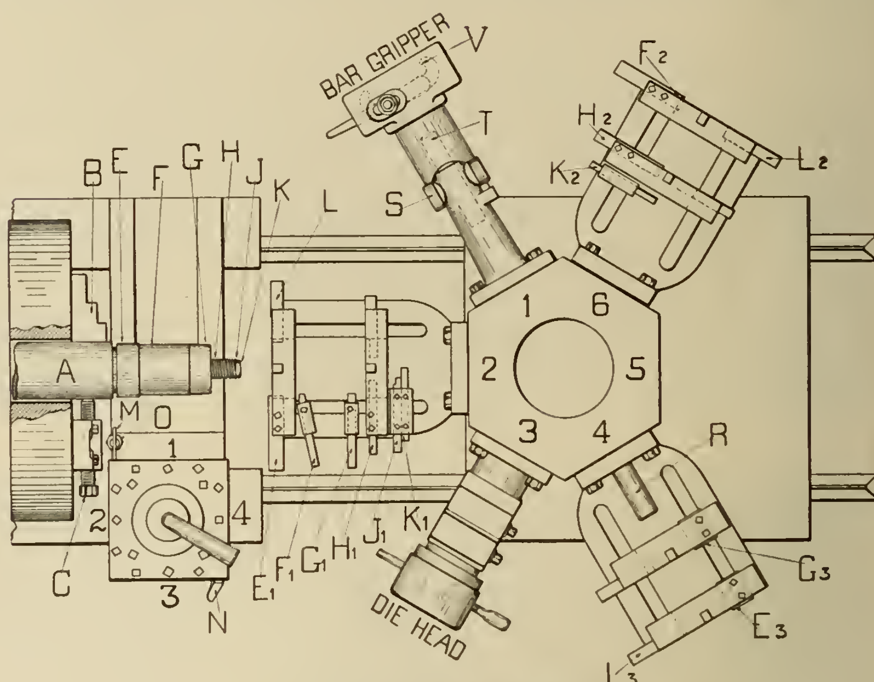
The first operation consists in removing the major portion of the stock and bringing the pin approximately to size. This roughing operation is completed by the cutters shown in the box tool attached to face "2" of the main turret, the cutters "E-1," "F-1," "G-1," "H-1," "J-1," and "K-1" removing the stock on the surfaces indicated by the corresponding letters on the piece itself. Just before starting this roughing head the tool post tool "N" is used for truing up the end of the bar.

The piece thus being brought approximately to size, the next operation consists in bringing surfaces "F" and "H" to exact size. This is done with the cutters "F-2" and "H-2" in box tool on face "6" main turret. Cutter "K-2" faces the end "K" of the piece and at the same time gauges the length of the pin; "L-2" acts as a back rest for supporting.

Next the box tool on face "4" of main turret is swung into position and the cutters "G-3" and "E-3" bring surfaces "E" and "G" to correct size and taper; the arbor "R" is arranged as a gauge to determine the proper location of the tapered surfaces, thus insuring duplicate work when cutters "E-3" and "G-3" are once properly set; "L-3" is a back rest.

All surfaces on the pin having thus been brought to size, the next operation consists in cutting the thread, which is done with the die head on face "3" of the main turret. This completes the piece and the tool post cutting off tool "M" supported by post "O" is then used for cutting off.

After the piece has been cut off the jaws and blocks are loosened and bar gripper shown on face "I" of main turret is swung into position. This bar gripper consists of a pair of self-acting jaws shown at "V" for gripping the piece and drawing it out, and an arbor at "T" for pushing the piece back to the desired length. The operation is as follows. Through rapid traversing device the bar gripper is brought rapidly to the piece and through the self-acting jaws "V" grips the stock firmly; then by operating the turret rapid traversing device the bar is drawn out to approximately the proper length. The jaws "V" are then released and the forward half of the bar gripper is swung upwards at right angles on the hinge "S," thus exposing the arbor "T" which is used to push the piece back to proper length for the next pin.



Finishing Cross Head Pins.

Major W. H. Laurie, of Laurie & Lamb, consulting engineers, Montreal, left on May 16th for a couple of months' stay in England. He will visit the works of Belliss & Morcom, Birmingham, and Crossley Gas Engine Co., Manchester, while in England.

The New Le Blond Universal Cutter and Tool Grinder

Machine Just Being Placed on the Market by the Le Blond Machine Tool Co.; Completely Illustrated and Described; Several Attachments.

The machine is absolutely universal, and will grind any where on any shape of cutter, grind any angle, taper or face. It is adapted for grinding all kinds of cylindrical, internal face and angular work, face mills, end mills reamers, counter bores, circular saws, snap gages, gear cutters, rose reamers, flat surfaces and all other tool-room work.

Is analogous to that of the universal milling machine, consisting essentially of a column, knee, saddle, swivel carriage and table. This gives the greatest rigidity, and is well adapted for taking the large inserted tooth cutters so frequently met with in modern milling practice. Combined with this, is the absence of all stems, posts, split bearings and joints common in most grinders.

Scheme of Manipulation.

The arrangement of the levers for operating is novel, and so disposed as to be convenient to the operator in any position which he may be in relation to the machine. This admits of close observation of the action of the wheel on the work, and allows the operator to so arrange himself so that he can give the work his closest observation and still have all adjustments before him. This can well be seen in the illustrations.

It will be seen that the cross feed and quick traverse lever for table, extend through the machine and have a crank at both ends respectively, and can be adjusted to suit the position of the operator. All adjustments are provided with a fine feed through hand wheel at front of the machine. Fixed clamping handles are on all parts for locking them in any position.

Oiling Facilities and Dust Protection.

The most careful consideration has been given to the thorough lubricating and protection of all cylindrical and flat bearings. All oil holes have dust proof covers and all bearings are lubricated through felt pads. The spindle bearings have dust proof collars. The saddle and table bearings are provided with covers, and are never exposed. The knee bearing on column has felt wipers.

Parts of the Machine.

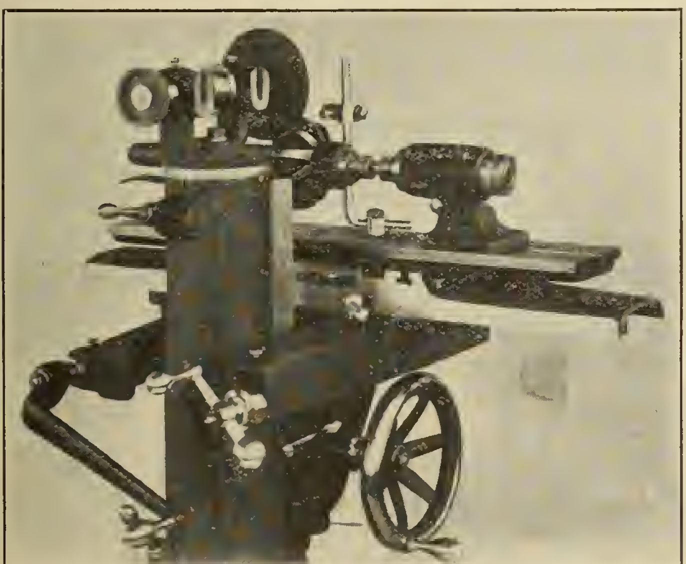
The wheel spindle has taper box and is driven by a single pulley for 2-inch belt. Three spindle speeds, 3175, 4200 and 6365 R.P.M. are obtained with the countershaft, permitting the correct surface speed for various size wheels. One end is bored for "LeBlond" S.A. Collet, and enables wheels to be removed and replaced without the necessity of truing up. The spindle is eccentric with the column and with the cross movement the minimum and maximum drain of cutters that can be taken in, is greatly increased.

The knee is of box section and swivels on a supplementary sleeve upon the column through an arc of 360 degrees. It has a vertical adjustment of $8\frac{1}{4}$ inches below the centre of wheel spindle and formed cutters, hobs, reamers, etc., can be ground on their radial faces without the use of drop centres.

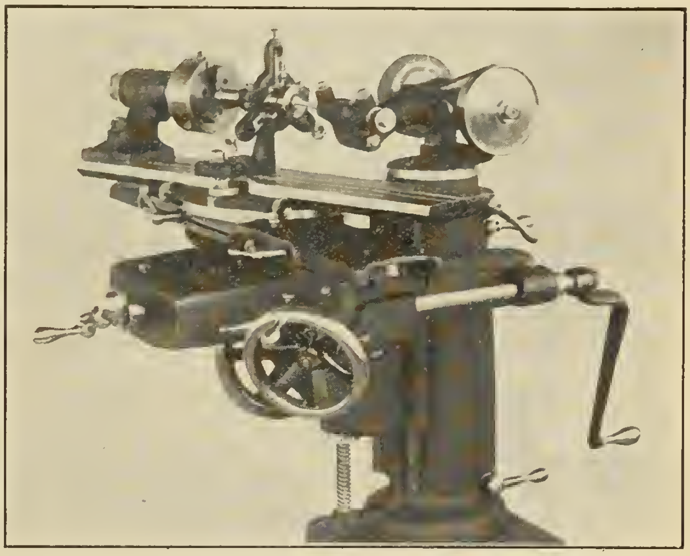
The saddle has an apron cast completely around it. that forms a cover for the knee as well as the cross feed screw at all times; it has a cross movement of $6\frac{1}{4}$ inches.

The table swivels through an arc of 90 degrees on either side of the centre and has a fine screw adjustment throughout this range for accurately setting to any taper. The base is graduated and is clamped rigidly with two clamping bolts in any position. It has a working surface of a longitudinal movement of 17 inches. A quick traverse through a lever and rack, and a fine feed for circular and internal grinder with a hand wheel, can be obtained.

Head and foot stock centres swing 8 inches and take in 18 inches between centres. The headstock spindle, which is tapering, revolves in a removable sleeve, which can be clamped in the V block of the universal attachment. The front end is threaded to receive chuck. The footstock has a spring centre actu-



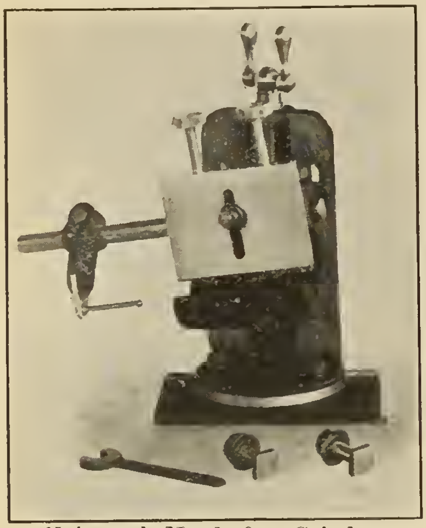
Grinding Face of a Formed Cutter.



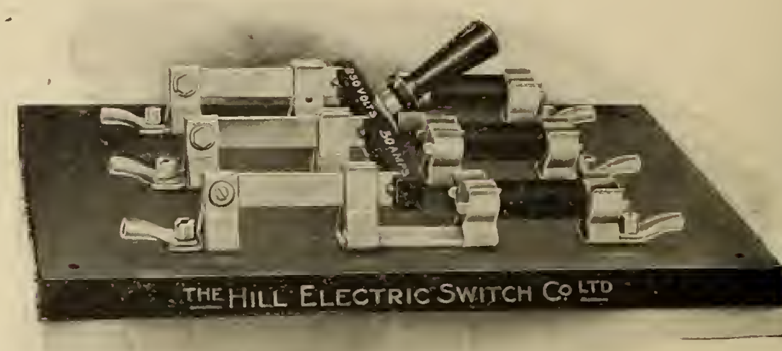
Internal Grinding: Taper Hole in Spindle

ated by a thumb lever. This centre can be removed and a special centre for grinding reamers inserted.

A complete set of stop and tooth rests are provided for all classes of work. then clamped in position. The gauge can then be swung back clear of the cutter. The table is provided with stops for regulating the depth of the cut. The attachment will take in cutters up to thumb screws at either end admit of delicate adjustment to the proper position. A floating centre attached to an adjustable bar can be set for any length and diameter of work.



Universal Head for Grinder.



The Hill Switch.

These are fully specified in the literature.

The journal boxes are provided with ring oiling bearing, and need to be filled but once a month. It is arranged to give three wheel speeds, has tight and loose pulley diam, for belt, and should run 425 R.P.M.

Gear-Cutter Grinding Attachment.

This attachment is made for grinding the teeth of gear cutters radial. If 6 inches in diameter; two bushings are furnished for cutters with $\frac{7}{8}$-inch, 1-16-inch and $1\frac{1}{4}$-inch holes.

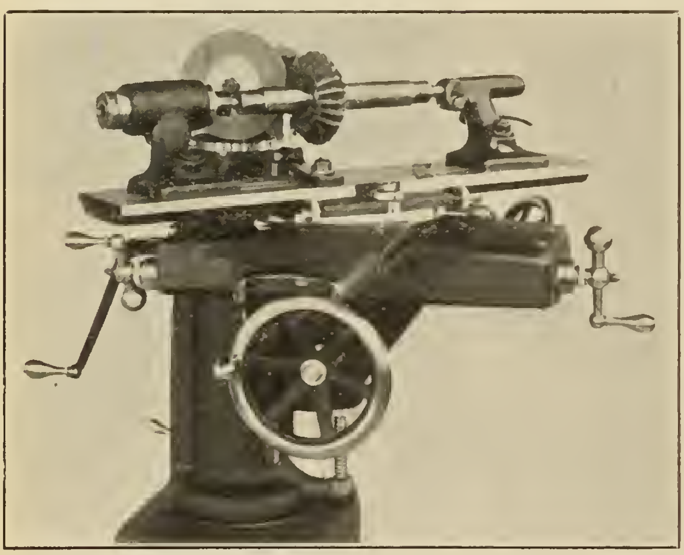
Universal Attachment.

This attachment is completely universal in all its movements. The head swivels upon the base and the V block can be swiveled completely around through a vertical plane. It will hold work mounted directly upon arbors, straight or taper shanks. The headstock

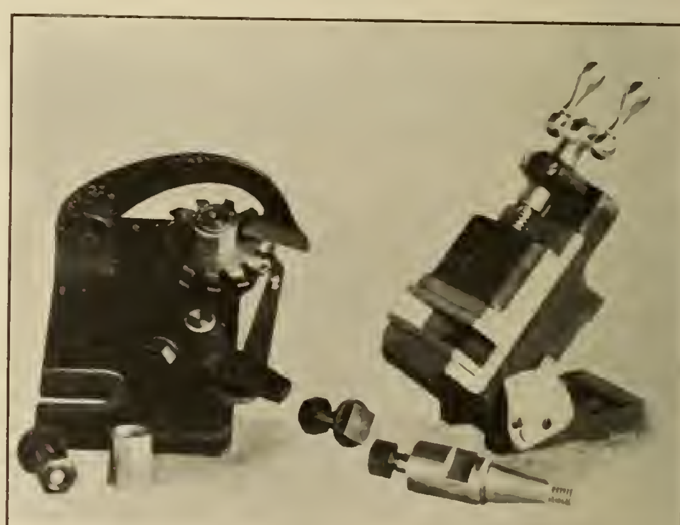
NEW ELECTRIC SWITCH.

The Hill Electric Switch Co., Ltd., Montreal, has added a type "D" to their other lines, shown in accompanying illustration. These switches are made in all styles from 25 to 100 ampere, inclusive, both 250 and 500 volts d.c. spacings.

Conducting parts are of hard drawn copper. All contacts are ground in, and of area amply large to successfully carry heavy overloads. Price lists will be furnished on application to the company by mentioning Canadian Machinery.



Grinding 45 Degrees Angle Cutter.



Gear-cutter Grinding Attachment and Universal Vise.

ground otherwise, the shape of the tooth cut by them will not be correct. A spring pawl can be adjusted to bring the radial face of the tooth against the gauge which swings over the cutter and sleeve and spindle can be clamped in the V block and can be used for grinding work held in the chuck, such as cones, cups, collars, etc. The work is clamped by an adjustable jaw. Two

Mr. Gourlay, of the MacGregor-Gourlay Co., Galt, manufacturers of wood and iron working, has retired from active partnership in the business owing to poor health.

Formulae for Power Required by Railroad Shop Tools*

Curves to Determine the Horse Power Requirements of Various Tools Under Ordinary Conditions, and Formulae for Special Cases

By L. R. POMEROY

Generally speaking, the generator capacity for railroad repair shops is equal to approximately 15 kilowatts per locomotive pit, or space in erecting shops occupied by one locomotive. This includes the requirements for tools, cranes, heating, blower and exhaust fans, that is, provides for all power required except that needed for lighting.

The tools alone require about 9 or 10 kilowatts per pit; the heating, and the blower and exhaust fans demand 5 kilowatts per pit, while 3 kilowatts per pit will care for the ordinary shop and adjacent yard lighting. If in addition to shop requirements power is needed for lighting terminal yards, buildings, etc., an increase in generator capacity must be made to cover such demand.

The following curves, Figs. 1 to 8, together with the tables, are submitted to cover the horse-power requirements of the machine tools generally found in railroad repair shops.

Occasionally certain tools are selected for the purpose of performing extra-heavy service, to utilize the full capacity of the new rapid-cutting tool steel, as is now done in manufacturing shops. In such cases the power to drive the machine must be figured on the basis of service required; but as these cases are few and exceptional, the curves will be found to meet the majority of conditions, and the exceptions can be taken care of by the following formula:

Horse-power to drive=FXDXf.p.m.X12 XNXC (1)

Where:

F=feed in inches,

D=depth of cut in inches,

f.p.m.=feet per minute,

N=a constant with the following values, depending on the class of material:

Cast iron	0.35 to 0.5
Soft steel or wrought iron	0.45 to 0.7
Locomotive driving-wheel tires	0.70 to 1.00
Very hard steel, such as crucible-steel driving-wheel tires	1.00 to 1.10

This formula is based on Professor Flather's dynamometer tests, which check up fairly well with actual motor tests, and it is, therefore, submitted with confidence.

As an example of the accuracy of this formula, the aggregate horse-power of 45 tests made with various tools was 247.7, while the calculated horse-power by formula equaled 247.2.

The extensive tests made by Dr. Nicolson, of the Manchester Technical School, England, confirm the correctness of the foregoing formula and form a very interesting contribution to the subject. A careful analysis of the results of these experiments shows the average horse-power required at the motor, per pound of metal removed per minute, to be as follows:

	Horse-power.
Medium or soft steel or wrought iron	2.4
Hard steel	2.65
Cast iron, soft or medium	1.00
Cast iron, hard	1.36

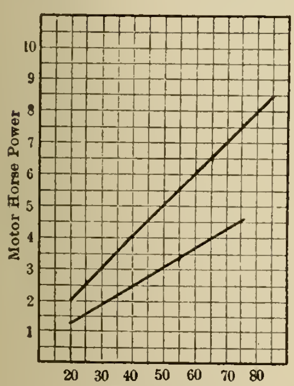


Fig. I. Drill Press, 15 to 20 Ft per Min.

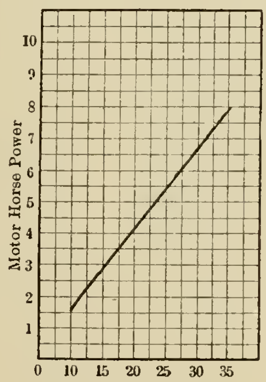


Fig. 2. Shaper, 15 to 20 Ft. per Min.

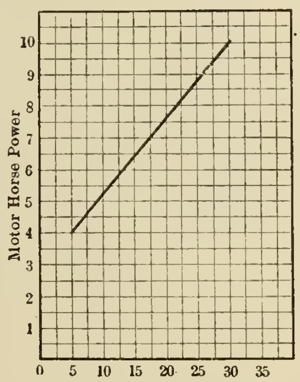


Fig. 3. Slotter, 15 to 20 Ft. per Min.

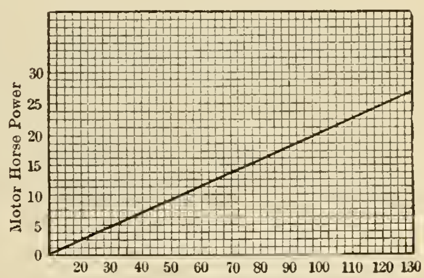


Fig. 4. Boring Mill, One Tool Cutting 20 Ft. per Min.

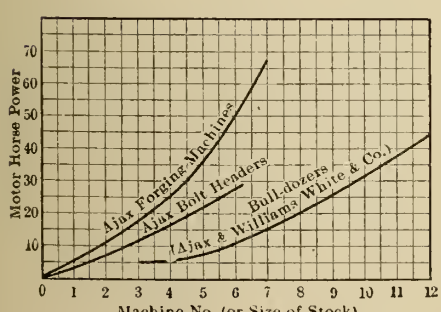


Fig. 5. Forging and Bolt Heading Machines

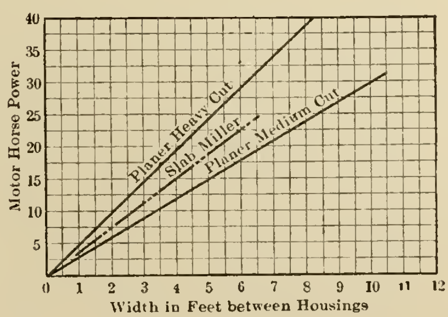


Fig. 6. Planers (Two Tools 15 to 20 Ft. per Min.) Ratio of Cut to Return 1:3

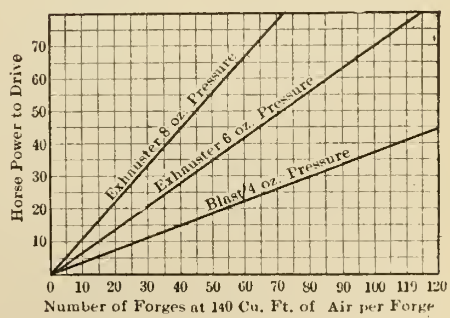


Fig. 7. Fans

Curves to Determine the Power Required by Railroad Shop Tools.

* From Electric Journal.

Using the symbolas of the previous formula, the horse-power becomes.
FXDXr.p.m.X12XNXWXK. (2)
where W equals the weight in pounds of a cubic inch of the metal and K is the co-efficient for that metal as given in the table above. The value of W for the different metals is as follows:

Cast iron	0.258
Wrought iron	0.278
Steel	0.284

The following examples illustrate the more or less heavy cuts to which reference has been made; the larger powers given are exceptional, while the average requirements are far below these, and all are submitted as actual cases which have come under the writer's observation:

(a) 100-inch driving-wheel lathe, (material, steel driving-wheel tires), 5-16-inch feed, 5-16-inch cut, at 18.5 feet per minute—two tools cutting.

Substituting in Formula (1) we have: 5-16X5-16X18.5X12X2XC=40 horse-power; same lathe, 3-16-inch feed, ¼-inch cut, as 16 f.p.m.—two tools cutting—3-16X¼X16X12X2XC=16 horse-power.

(b) Old 76-inch driving-wheel lathe (material driving-wheel tires), 1-16X¼X16X12X2XC=5 horse-power.

(c) Steel-tired wheel lathe (material engine truck wheels), 1-7X5-16X16X12X2XC=17 horse-power.

(d) Planer (material cast iron), 5-32 inchX⅜ inchX16 feetX12X0.35 (one tool cutting), 4.5 horse-power; (two tools cutting) 9 horse-power.

(e) Planer (material wrought-iron engine frame), 5-32 inchX½ inchX16 feet X12X2X0.5 (two tools cutting), 15 horse-power.

(f) 76-inch boring mill (on cast-steel driving-wheel centres), ⅛ inchX¾ inch X30 feet X12X3X0.45 (three tools cutting), 45 horse-power. Same machine boring driving-wheel tire, ⅛ inchX3-16 inchX28 feetX12X2X1 (two tools cutting), 15 horse-power.

(g) 84-inch boring mill (on 62-inch cast iron wheel centres), ⅛ inchX1-10 inchX30 feetX12X3X0.35 (three tools cutting), 4.7 horse-power. Same mill boring 44-inch steel tire, ¼ inchX3-32 inchX26 feetX12X2X1 (two tools cutting), 14.5 horse power.

(h) The following is a special test on an extra heavy driving-wheel lathe, and gives results representing unusual conditions. The operator was given a heavy bonus to develop the ultimate capacity of the machine: Average feed, 0.4625 inches; depth, 0.0423 inches, at 12.2 f.p.m. (two tools cutting).

These figures are the average of 37 tests, and representate a consumption of 40 horse-power, while the maximum horse-power required was about 65. The machine was equipped with a 40 horse-power direct-current motor with 2.1 per cent. speed variation.

The lathe in question was a "special," extra heavy, and of about double the ing-wheel lathe of equvalent size. On average work, the same investment if expended on two lathes will turn out more work in a year than this special machine.

For rapid estimates the horse-power required can be obtained by the following formulas:

(Single belt) horse-power=

$$\frac{d \times f \times r.p.m.}{12 \times 400}. \quad (3)$$

(Double belt) horse-power=

$$\frac{d \times f \times r.p.m.}{12 \times 400 \times 0.7}. \quad (4)$$

where:

d=diameter of smaller pulley in inches,

f= face of pulley in inches,

r.p.m.=revolutions per minute.

These formulas are very conservative and provide for about as much overload capacity for belts as is ordinarily as-

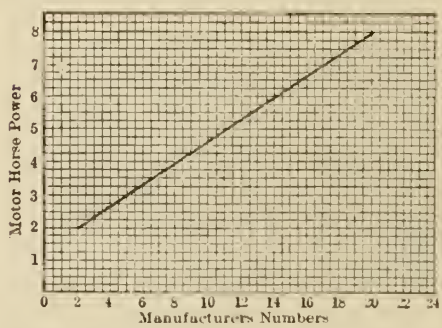


Fig. 3—Horse-Power Values for Pipe Threading and Cutting Machine in Railroad Shops.

sumed for motors; they also provide a liberal allowance for the influence of centrifugal force, and for the diminishing are of contact on the pulley when it is driven from a larger one.

They are equally useful in figuring the power required for woodworking machinery and were arrived at largely from experiments with such apparatus.

Another formula, adapted from Ruleaux, giving somewhat higher values, is preferred by some, as it considers the thickness of the belt. In this case the allowance for centrifugal force and for the arc of contact, being less than 180 degrees, is taken care of in the selection of values for the constant C.

Horse-power=tXwXf.p.m.XC (5),
or if the r.p.m. and not the f.p.m. is known.
Horse-power=tXwXd=r.p.m.=C.

where 4

t=thickness of belt in inches,

w=width of belt in inches,

d=diameter of pulley in inches,

C=a constant, of following values:

Leather belt	0.0062 to 0.0098
Cotton belt	0.0036 to 0.0068
Rubber belt	0.0050 to 0.0082

The tool builders do not always discriminate between the requirements of manufacturing plants and those of railroad repair shops, and for this reason motors are often recommended that are larger than necessary. For example: The finished product of the axle departments of such concerns as the United States Steel, Midvale, Bethlehem, and Cambria companies, becomes the raw material for railroad shops. In the former shops the forging is turned out from the hammer without much regard to finished dimensions, as it is much cheaper to rough out to size on special rapid-reduction lathes than to attempt to reduce the size under the hammer.

For such machining high power is required; but for the same lathes in railroad shops, where the work performed is mainly finishing cuts on journals and wheel seats, a smaller and cheaper motor may be selected.

The Bement-Niles lathe, which was furnished the Howard Axle Works, may be given as an example of extreme requirements, such as mentioned. The capacity of the machine is two cuts, each ⅝x⅛ inch at 60 ft. per min., and at this rate of cutting the machine will require a 60 horse-power motor.

Another machine built for the same class of work and used largely in axle shops and in many railroad shops, is capable of taking two cuts of ¾x½ inch, at 24 ft. per min. This requires 18 horse-power, and the machine is usually furnished with a 20 horse-power motor.

While this power is all right for the full capacity of the machine, 10 horse-power will cover the requirements of the same tool on average railroad-shop work.

Engine Pits.

Number of pits required=

$$\frac{\text{(Total number of engines)} \times \text{(average number of days in shop)}}{\text{300 (number of working days in year)}}$$

Examples:

400 engines: average days in shop, 25.

$$\text{Number of pits} = \frac{400 \times 25}{300} = 33.$$

$$\text{Capacity per year} = \frac{\text{(Number of pits) } 300}{\text{Average number of days in shop}}$$

In order to reduce to about 20 the average number of days in shop that are required for general overhauling, it is estimated that the machine shop adjacent to the erecting shop should contain seven machine tools per engine pit, and

the floor area in order to accommodate seven tools per engine capacity, should be about 1,500 square feet per pit.

Power required for air compressors equals the delivery of free air in cubic feet per minute, at 100 pounds pressure of the compressor multiplied by 0.14.

Modern erecting and machine shops, including heating, cranes, etc., cost from $2.50 to $3.50 per square foot of inside measurement.

$$\text{Rate per k.w. hour to cover fixed charges} = \frac{\text{total fixed charges per year.}}{(\text{max. demand}) \times 8760 \times (\text{load factor}).}$$

Illustration.

Fixed charges ....$8,330.00.
Maximum demand ......500 kilowatts.
Load factor ....33 per cent.
Then:

$$\text{Rate} = \frac{\$8330}{500 \times 8760 \times 0.33} = 0.0057$$

Power Values for Various Machines.

BOLT AND NUT MACHINERY, HELVE HAMMERS, MULTIPLE DRILLS, ETC.

	Motor Horsepower Required to Drive.
One and one half-inch single-head bolt cutter	1½
Pratt & Whitney No. 4 turret bolt cutter	2
Two-spindle stay bolt cutter	2
One and one half-inch Acme double-head bolt cutter	2½
One and one half to two and one half Acme nut facer	2½
Six-spindle nut tapper	3
One and one half-inch triple-head bolt cutter	3
Three-fourths to two and a half-inch double head bolt cutter	3
Two-inch triple-head bolt cutter	5
Four-spindle stay bolt cutter	5
Bradley hammer	7½
Niles four-spindle multiple-drill	7½

GRINDERS.

	Motor Horsepower Required to Drive.
Air-cock grinder	1
No. 3 Brown & Sharpe universal grinder	3
Link grinder	3
Sellers universal grinder for tools	5
Norton 18x96-inch piston-rod grinder	5

MILLERS.

	Motor Horsepower Required to Drive.
Vertical miller Becker-Brainard No. 2	1
Valve miller No. 2	2
Universal miller No. 3 Brown & Sharpe	2
Universal miller No. 4 Brown & Sharpe	3
Universal No. 6 Becker-Brainard	5
Niles heavy vertical	10

PUNCHES AND SHEARS.

	Motor Horsepower Required to Drive.
No. 4 36-inch throat L. & A. punch	3
No. 9 horizontal flange punch	5
No. 2 Hillis & Jones combination punch and shear	5
Alligator shear (stock 5x1 inch)	5
Lenox rotary bevel shear	7½
Thirty six-inch multiple tank plate punch with spacing table	7½
No. 3 Hillis & Jones combination punch and shear, 12-inch throat	7½
No. 2 horizontal punch 20-inch throat	7½
No. 3 Hillis & Jones combination punch and shear, 36-inch throat	10
No. 3 angle shear 5x1-inch bar	10

SAWS.

	Motor Horsepower Required to Drive.
Band saw, 36-inch wheel	3
Band saw, 42-inch wheel	5
Swing cut-off saw	5
Band saw, 48-inch wheel	7½
Greenlee No. 1½ self-feed rip saw	10
Greenlee vertical automatic cut-off saw	15
Forty to forty six-inch saws	15
Automatic band resaw	20
Greenlee No. 6 automatic cut-off saw	20
Greenlee No. 3 rip saw	20
Woods No. 4 rip saw	20
Extra heavy automatic rip saw	25

WOOD-WORKING TOOLS.

	Motor Horsepower Required to Drive.
Fay-Egan single-spindle vertical boring machine	3
Fay-Egan three-spindle vertical boring machine	4
Fay-Egan No. 6 vertical mortiser and borer	6
Fay-Egan No. 7 tenoner or gainer	7½
Fay-Egan universal wood worker	7½
Fay-Egan four-spindle vertical borer	7½
Fay-Egan five-spindle vertical borer	10
Fourteen-inch inside molder	12
Fay-Egan universal tenoner and gainer	12
Fay-Egan vertical tenoner	12
Greenlee automatic vertical tenoner	15
Fay-Egan No. 3 gainer, also Greenlee	15½
Greenlee extra-range five-spindle borer and mortiser	15
Greenlee vertical mortiser	15
Fay-Egan automatic gainer, also combination gainer and mortiser	20
Fay-Egan No. 8 vertical saw and gainer	20½
Vertical hollow chisel mortiser and borer	20
Fay-Egan 14½-inch double-cylinder surfacer	20½
Heavy outside molder	20
Six-roll direct-connected planer and matcher	25
Double-cylinder fast flooring machine	30
Double-cylinder planer and matcher	30
Fay-Egan No. 8 automatic tenoner	30½
Woods No. 27 matcher	35
Four-side timber planer, heavy	60

HOW WAGES GO IN GERMANY.

The Ludwig **Loewe** shops **in Berlin** are working 462 machine tools with 475 men. These are skilled workmen. The greatest number of machines handled by one operative is five. The Loewe works produce some of the best machine tools made in Germany. This establishment may be taken as an example of those shops which may be considered as strong competitors of the best American machine tool houses. Approximately 2,000 men are employed at the Loewe plant. A large percentage are unskilled, but in the machinery department, which is devoted especially to the making and assembling of machine tools, there are 475 men. In this department the average number of machines attended by one man does not exceed one. This average is reached by separating foremen and those in charge of groups of the men who actually attend machines. In the assembling department, the average number of machines attended by one operative approximates 1½. In this department there are 304 operatives and 432 machines.

The rule at Loewe's calls for 54 hours of work per week per man, and the wages paid vary between 45 pfennigs per hour for unskilled labor to 1.25 marks and even more for skilled men (100 pfennigs equal 1 mark, which equals 23.8 cents). The expert men are generally paid by piecework. The average rate of wages paid by the hour, in pfennigs, is as follows:

Foremen in assembing department	80
Vice men	60
Skilled lathe men	66
Skilled planing men	70
Skilled milling machine men	72
Skilled men for boring mills	71
Skilled men for grinding machines	70
Molders	72
Core makers	60
Carpenters	53
Patternmakers	65
Forge men	72

The above, it must be understood, are guaranteed wages. As a matter of fact Loewe's men are dissatisfied if they do not earn at the tools 85 pfennigs per hour. This they can readily do under the piecework policy. These men pay for house rent sums varying from 240 to 270 marks per annum. The price paid depends upon the location in the city. For the foregoing sums one room and a kitchen can be obtained. For two rooms and a kitchen house rent varies between 420 and 480 marks per annum.

Berlin workmen obtain higher wages than those in other parts of the empire. These Berlin men also have a reputation of being the best workmen in Germany. Loewe does much for his men in the way of social welfare.—Daily Consular Reports.

Honesty is just simply a business proposition, so there is no moral credit in it.

Workingmen want kindness more than more pay—you can't pay people to take abuse.

MACHINE SHOP METHODS AND DEVICES

Unique Ways of Doing Things in the Machine Shop. Readers' Opinions Concerning Shop Practice. Data for Machinists. Contributions paid for.

JIG TO PLANE CIRCULAR ARCS.

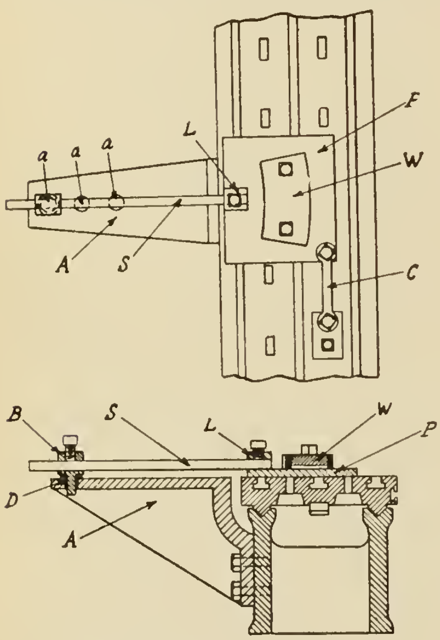
By J. H. R., Hamilton.

The accompanying sketch is of a jig used on a planer to plane the circular arcs on pan section dies and similar work.

The angle plate A is bolted solid to the planer bed and one or more holes, as a, a, a, bored in the face level with the planer table.

A large parallel plate P, with a lug L on one side, is placed on the table free to move, but for the link C.

The shaft S connects the plate with the swivel block B. The work W is fastened to plate P so as to have the required radius from the centre of motion B to the face that is being planed. The small bush D is to act as a bearing



Jig to Plane Circular Arcs.

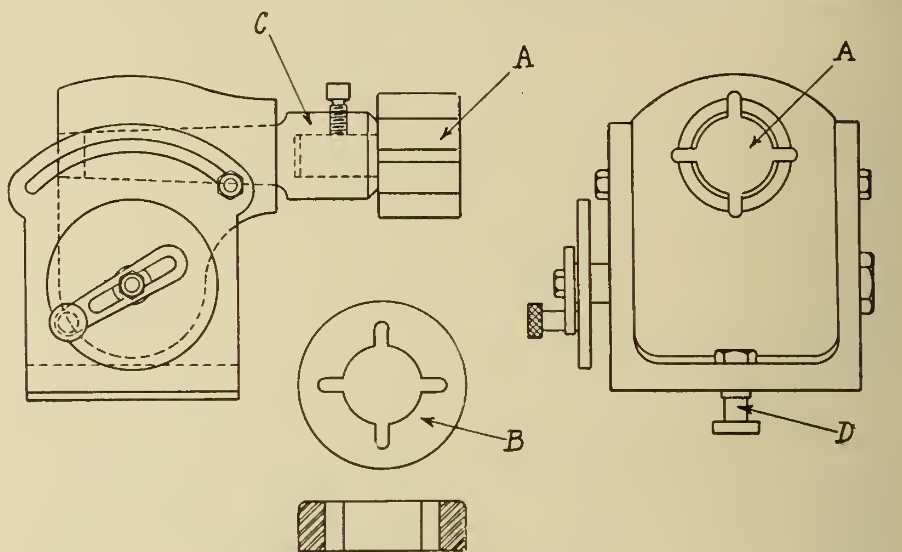
for pin on block B, and to bring the shaft parallel with the planer table.

MAKING USE OF AN OLD DIVIDING HEAD.

By Chas. Hoth.

The accompanying illustration shows an old dividing head used as a jig on a shaper to shape out odd jobs, such as small punches and dies and similar work, where part of a circle is to be formed, broken by grooves or ribs, or in cutting equally distant ribs or grooves in any small blank.

The punch A and die B shown in the sketch are for making parts of a lamp burner, and as there are several other dies and strippers after the same style, the dividing head has proved a very useful article for the purpose.



Making Use of Old Dividing Head.

KEEPING TRACK OF MISCELLANEOUS DATA.

By Harry M. Chase.

Having read your paper with much interest and noted the rapid strides it has made into the good graces of mechanical men of my acquaintance, I take the liberty of writing a description of my system of filing and indexing miscellaneous data, which I think perhaps may be of benefit to some of your readers.

The many men in positions of authority who find it necessary to keep a quantity of miscellaneous data on hand for reference, have in many cases to waste much time as well as patience in hunting for the particular sheet that they require. Some, indeed, have been picking up a bit here and there and while it is valuable information it loses its helpfulness because of the owner's inability to lay his hand on it readily.

I have worked out a little system that I find simple and convenient for filing and indexing data of all kinds and I give it to whoever may find it helpful.

The idea is similar to what is found in some drawing offices. Each piece has a separate drawing and as the tracing is finished it is given a number. These numbers run consecutively, irrespective of where the piece is to be used. This necessitates what is called an alphabetical index, giving the name of the piece and its number.

Now, take for instance, the data that is found in technical periodicals.

S

Steel (nickle) 7-48-179-214-215.
(carbon) 19-27-95-146-388.
(vanadum) 22-96-317.
(self-hardening) 78-146-199-301.
Shafting (formulae) 141-315.
Steam (properties of) 77-98-159-187-306.
(superheated) 183-352.
Sheaves (for ropes) 147-283-284.
(chains) 318.
Springs (vehicle) 41-89-350.
(coil) 111-215-291-292.

Fig. 1.

When I receive a magazine I read it and put it away until I have a pile of them and then I take an hour or so and, starting at the bottom of the pile, I cut out all sheets that have anything

on them worth saving, keeping the sheets in their proper order. This keeps continued articles together and in order. Then taking these sheets I have cut out I number them consecutively in the upper right-hand corner, commencing where I left off with the last lot. Then I enter them in my index, which is a small loose-leaf, fine-ruled pocket book, indexed. Suppose the first sheet has an article on gearing and is number 325, I look up sheet G, and after the word gear, write the number 325 together with any little note that will be helpful later. The sheet shown in Fig. 1 may tend to make my meaning clearer.

There is the word "steel," this subject is sub-divided under the different kinds, and after these are found the numbers of the sheets on which articles on these subjects may be found. Articles that deserve special notice or are unusually comprehensive are underlined.

By this system I can see in a moment whether or not I have any information on a subject and can tell just where

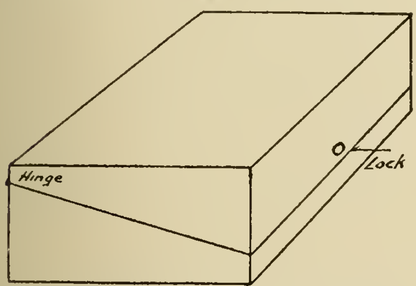


Fig. 2—Keeping Track of Miscellaneous Data.

to find it. The efficiency of my miscellaneous data has increased many times over since I started this system of keeping track of it.

Fig. 2 shows a sketch of the box I keep it in, and I find it much more convenient than long shelves of magazines, four-fifths of which is advertising matter. The box is 11 in. by 16 in. by 4 in., inside measurements.

Now just a few donts:

Don't begrudge an hour or so occasionally to your index when you make it up. You will get it all back with interest.

Don't fail to put notes in it and make it as explicit and self-explanatory as possible.

Don't put anything in your data file you have not read thoroughly.

Don't keep a mass of magazines lying around gathering dust, when a small box will serve the same purpose.

Don't let every Tom, Dick and Harry paw your sheets over.

STANDARD SHAPE FOR CUTTING TOOLS.

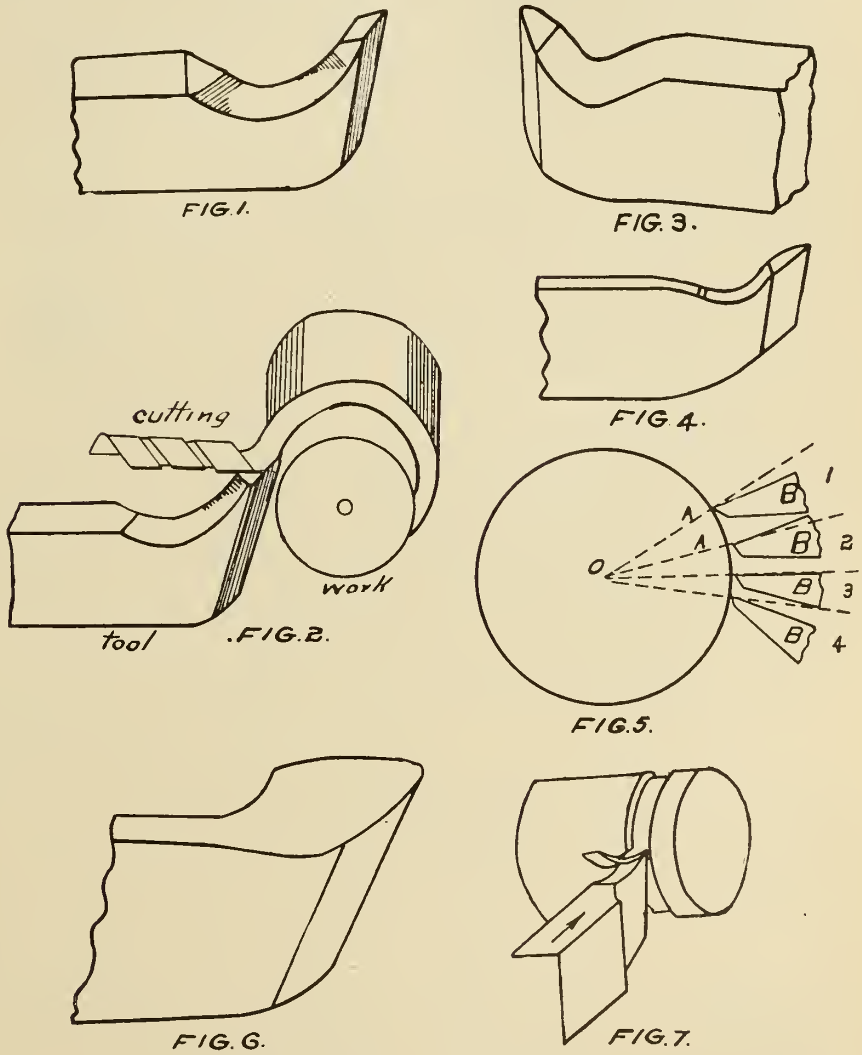
By C. Charles Maison, E.E.

The cutting tools for lathes are composed of very fine grain of "cast steel," and are hardened by heating them to a red heat and dipping them in water, and they are subsequently reheated to temper them, or lower their degree of hardness, which is absolutely necessary for work tools.

These cutting tools are divided into two principal classes: i.e., slide rest tools, and hand tools. The former are stand out from the tool clamps, or part that supports it.

Lathe tools are numerous and mention only of a few will be taken up. They are designed either from the nature of the work, or from some characteristic peculiar to the tool itself.

The term diamond shaped "tool or point," is given because the face of the tool is diamond shaped, but in England and in some practice in the United States, the same tool is termed a front tool, because it is employed on the front of the external work. Figs. 1 to 7 show some forms of diamond shaped tools.



Standard Shape of Cutting Tools.

those held in the slide rest, and hand tools which constitute the latter are held in the hand. The latter, however, have lost all their former importance in the practice of machine shops to-day, by reason of the employment of self-acting lathes. The proper shape for lathe slide tools, depends upon the following: 1st, the kind of material to be cut; 2nd, upon the amount of metal to be cut off; 3rd, upon the purpose of the cut, as whether to rough out or to finish the surface; 4th, upon the degree of hardness of the metal to be cut; 5th, upon the distance the tool edge is required to

A side tool is one intended for use in the side faces of work as the side of a collar on the face of a face plate.

An outside tool is one for use on external surfaces, and an inside tool for internal, as the walls or boxes of tools, etc.

A spring tool is formed to spring or yield to excessive pressure, rather than dig or jump into the work.

A boring tool is one for boring purposes. The principal forms of cutting tools are, the diamond pointed tools, the side tools (right and left), and the cutting or parting tool. The manner in

which the tool is used is shown in Fig. 2, while in Fig. 1, the form of a diamond tool is shown. The cutting qualification is governed to a great extent by the position in which the tool is presented to the work. Thus in Fig. 5, let O represent a piece of work, B B B B four tools having their top and bottom faces grooved at the same angle to each other. In position I, the top face of the tool is at an acute angle below the radical line A, hence the tool possesses top rake, the amount being about suitable for hard steel or hard cast iron. In position 2, the top space is at an acute angle above the radical line A, therefore, the tool has negative top rake, the amount being about suitable for brass work under some conditions. In position 3, the top face has no rake of any kind, and the tool is suitable in this respect for any kind of work.

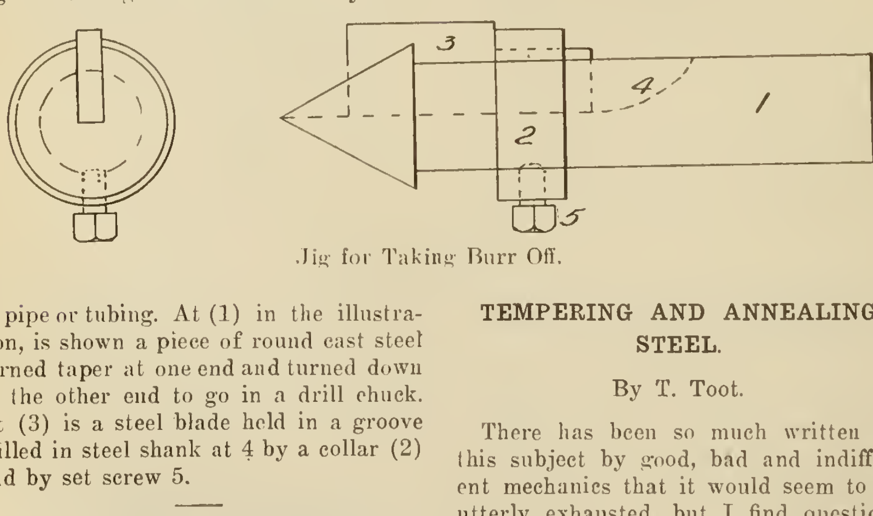
In small work where the cuts are not so great, and where but one roughing cut is taken, it is an object to have the roughing cut leave the work with as smooth a surface as possible and the amount of side rake may be very small, in consequence of which, a tool as in Fig. 6 only, of small rake may be used.

The tool as shown in Fig. 7, is usually used for parting or cutting off tools for wrought iron, its feed being directly into the metal as denoted by the arrow. This tool should be set exactly level with the work centre when it is desired to completely sever the work; when, however, it is used to cut a groove, it may be set slightly above the centre.

TOOL FOR TAKING BURRS OFF PIPE.

By L. Bailey.

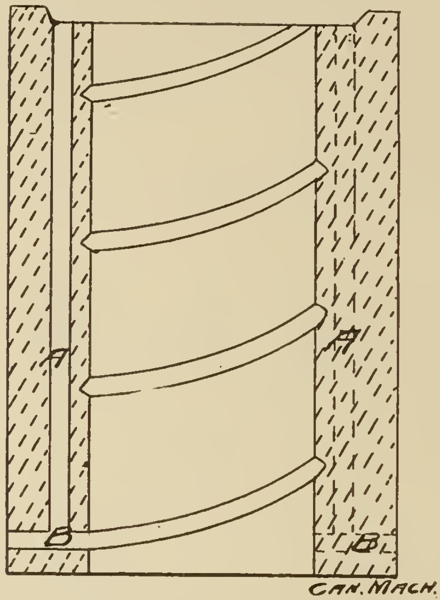
The accompanying sketch illustrates a very handy and useful tool for squaring and taking the burr out of any kind of pipe or tubing. At (1) in the illustration, is shown a piece of round cast steel turned taper at one end and turned down at the other end to go in a drill chuck. At (3) is a steel blade held in a groove milled in steel shank at 4 by a collar (2) and by set screw 5.



Jig for Taking Burr Off.

OILING DEVICE FOR VERTICAL BEARING.

On some special machinery which the Otto-Higel Co., Ltd., Toronto, makers of piano keys and actions, have in their machine shop, is employed an automatic oiling device for high speed vertical bearings which has given excellent satisfaction. It is also used on cream separators with good results. The accompanying illustration is of a bushing containing this device. As shown A there are two or more blind holes drilled in the bushing; at B a hole is drilled as shown, and from this hole a thread with a large pitch is cut on the inside of the bushing. If the spindle runs in the right hand direction this will be a left hand thread or vice versa. The oil is held on the top of the bushing around the shaft and runs down the two or more holes and out to the spiral groove or thread. The centrifugal force causes the oil to travel to the top of the bushing through this groove. Thus a continual circulation of oil is maintained.



Oil Device for Vertical Bearings.

TEMPERING AND ANNEALING STEEL.

By T. Toot.

There has been so much written on this subject by good, bad and indifferent mechanics that it would seem to be utterly exhausted, but I find questions and answers in most every mechanical journal I pick up on the best methods of tempering and annealing, especially the high speed steels used to a great extent these days. The writer doesn't claim to be an expert, but being a practical steel worker for twenty years and reading and absorbing every scrap of information possible on the subject, and having the faculty of separating and making use of the good points gained by practice in that time, I think I can give some pointers that will be of value to any one who cares to profit by the advice of the undersigned.

The prevailing trouble with most steel workers is, they let their hands run away with their head to the extent that their work becomes mechanical, and in this age when different grades and classes of steel are used in most shops, the head should always be in the lead and be master of the situation. It stands to reason that it takes a different dip and different color for a high grade carbon steel than it does for a lower grade carbon. No shop that can avoid it will buy the higher priced steel when a lower priced steel will answer the same purpose. This is made the more possible by an intelligent, heady tool dresser that knows the difference and gets results from both.

In the thorough annealing of carbon steels, lime, sifted ashes, or charcoal dust give the best results, but any substance that is perfectly dry and will pack close will do nicely. The pieces should be heated evenly throughout to a bright red and buried deep. In water annealing I heat the piece to a low red and lay it aside until it will no longer scorch a pine stick, then cool it in ordinary water. Of course, the tempering of carbon steel is of a different character, and it takes good heating and an observance of the closest details and a thorough knowledge of the use and requirements of the tool, to get the best results. One source of failure with most smiths is they will persist in dipping the tool too hot. A perfectly even heat and dipping at the right temperature for the required hardness comes alone with practice and experience. I have seen quite a lot in different journals lately about the annealing of high speed steel, many claiming they cannot get the steel soft enough to machine. Here's where the glutton for knowledge steps in and paves the way, for it is only the glutton that will experiment and persevere until he finds what suits the occasion best.

I have no trouble whatever in annealing the high speed steels in the following manner, and I never heard a kick about pieces being too hard to machine, after I tried the following: I take an old ladle bucket or any iron receptacle large enough to hold the steel to be annealed. I fill this one-third full of well burnt, perfectly dry molding sand. I then put in half an inch of dry cast iron borings on the sand, heat the pieces of steel slowly to a bright red and lay them evenly on the borings and put more

borings on top until the steel is well covered; then fill the pot to the top with the burnt sand and leave it until cold. This anneals novo and blue chip perfectly, so they can be machined as easily as carbon steel, and it does not affect the hardening qualities a particle. The borings should be as fine as possible and free from oil. Charcoal dust and the burnt sand will both anneal to a certain extent, but not as thoroughly as with the fine borings added.

In hardening this class of steels I use both air and linseed oil. The heat should be as short as possible and white hot, and the cutting point dipped about one inch in the oil and when quenched sufficiently, transferred to the air blast to cool the body of the tool. I have had high speed tools that lost their hardness and when this occurs, I harden them by dipping in boiling water, just so the cutting edge is immersed, and let the body of the tool cool off of itself.

Don't be in too much of a hurry on steel work, for it is only the man that pays the strictest attention to details and makes haste slowly that is thoroughly successful. If your work is pushing so it is necessary to have more than one piece in the fire, don't ram them all down next the blast, but put those you are not working with, on the side, so they will not overheat, and take them up in their turn.

Where several different grades and kinds of steel are used, mark them so you can tell at a glance what they are and what they require and put the marks down on a card and hang it up handy, so you can tell what they are, should you, perchance, get mixed up in your marks. Study your work and methods and ask questions of those you do work for. Work to please them, for a willingness to please sometimes covers a multitude of grouchiness and slovenliness in one's work. It is surprising how a little joke well told and a willingness to accommodate the man in a hurry will sometimes smooth the wrinkles of ill temper and make a tool do the work when otherwise he would throw it out the window and wish perhaps he had you there to follow the tool.—Railway and Locomotive Engineer.

BORING AND TURNING FIXTURE FOR CONNECTING-ROD BRASSES.

By E. Beck.

Some time since, having charge of a shop manufacturing steam engines, and after having the management inform me that such and such engines could be considered as standards, I made jigs and templets for such parts as we were apt to be called upon to replace.

The illustration shows a turret-lathe fixture for boring and turning connecting-rod brasses.

The brasses, after having been planed or milled to gauge, were fitted by filing or scraping to a standard fitting fixture or gauge conforming to the inner dimensions of the connecting-rod straps of the different sizes of engines. By this method we were able to duplicate all our connecting-rod brasses. Many of the engine parts were carefully and accurately made, relieving us of all anxiety when sending away repairs as to whether the parts would fit just right. This method of doing work would make the first cost of the finished parts more, but in the erecting of engines we more than squared ourselves, besides having the satisfaction of doing work the right way.

Fig. 2 is a face view of the fixture looking toward the headstock, and is made in the form of a face plate screwed upon the lathe spindle. Cast to this face plate is a cradle A having a hub at each side central with the spindle for spring-actuated time plugs B entering the swivel work-holding yoke C. The cradle is strongly ribbed at each side; the time plugs are pulled out to the limit and slightly turned, a pin D holding them out until the work yoke has been turned one-half around, when the yoke is again locked with time plugs. The yoke has a bearing at the lower end E as well as an overlapping cap F at the upper end. The cap is bolted to the yoke with swing bolts, the end of the cap having openings to permit the bolt to swing freely. On the upper part of the cap two bosses are seen; these retain a strong spring-actuated plunger that forces against the brasses or work; this is advisable, as the workmen need not be so fussy about the length measurement of the brasses, and also the brass plate from which we cut the liners, shown between brasses, would vary slightly in thickness.

An adjustable swinging arm G forms the upper bearing, and is best seen at Fig. 1. This arm swings so as to put work into or take it out of the fixture. The arm is hinged to a screw-adjusted slide, the adjustment of this slide being to accommodate the many different yokes used. The arm is bolted to the slide by a swing bolt. The outer end of the arm is bored to receive a tool-steel spherical-faced plug H that enters into a steel plate in the yoke cap. This allows the yoke to be freely revolved after pulling the time pins. The yoke is thus held at four points and is very rigid.

The work is shown in broken lines. A size block I is also shown from which the lathe operator sets his tools. This is a quick and very reliable measurement, as the yoke thickness is made to a nicety, the thickness of yoke being 0.001 inch less than the gauge or master strap to which the brasses were planed and fitted. The turning of the brasses is done by a tool in the cross slide, while the boring is done with boring bars entering the turret and lathe-spindle bush. Turning and boring are both going on at the same time. The different tools for boring and turning are not shown, being immaterial.

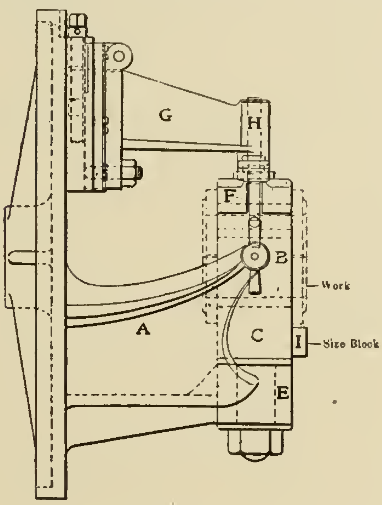


Fig. 1.

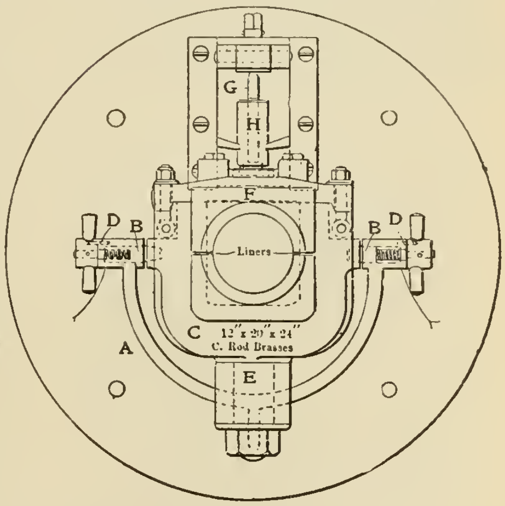


Fig. 2.

Fixture for Boring Connecting Rod Brasses.

All our yokes were marked for the different engines or jobs, and were kept in a suitable place. A very ordinary workman could turn out a large amount of first-class work with this fixture. This arrangement is quite simple, but effective. A number of parts were done in this fixture other than connecting-rod brasses.—American Machinist.

NEW TELEPHONE NUMBER.

Owing to inability to secure a sufficient number of lines into the Toronto office of the MacLean Publishing Company in consecutive numbers, it has been found necessary to change the telephone numbers for that office. The numbers are now Main 7324, 7325 and 7326.

DEVELOPMENTS IN MACHINERY

New Machinery for Machine Shop, Foundry, Pattern Shop, Planing Mill; New Engines, Boilers, Electrical Machinery, Transmission Devices.

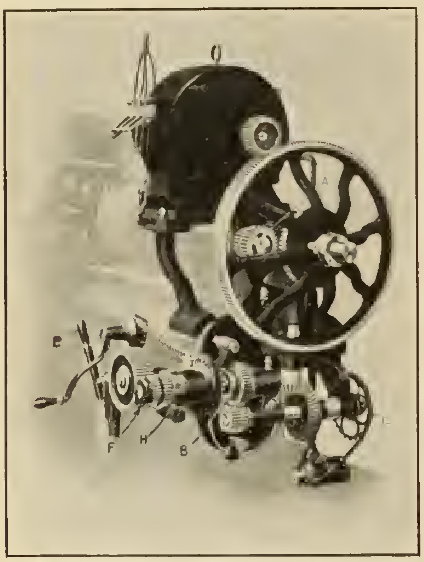
MOTOR DRIVEN AUTOMATIC MACHINE.

The National-Acme Manufacturing Co., Cleveland, Ohio, will put on exhibit and demonstrate at the Railway Master Mechanics' and Master Car Builders' convention at Atlantic City, June 17th to 24th, their multiple spindle screw machine, equipped with motor drive.

Recent improvements in this size of machine provide for single belt drive, which is readily converted into a motor drive by substituting gear G for pulley, and placing the motor platform and motor on the machine as shown.

The advantage afforded by the single belt drive and the relative changes are:

First. That they make the relation between the cam shaft and the spindle drive shaft always positive, eliminating accidents to tools due to belt slippage. Second. Belting and the resultant troubles are reduced to a minimum on the single belt drive and entirely eliminated on the motor drive. Third. The countershaft is simplified or eliminated. Fourth. The output of the machine is increased because the positive control of the change of speed for the tools allows the maximum use of the fast speed. Fifth. In case of accident or when stoppage for any cause is necessary, lever E provides for immediate release of the cam shaft mechanism. Sixth. It is possible to move tools intermittently when setting up or testing by use of lever E, which throws in clutch B. Seventh. Cranking by hand is a much lighter operation, due to the fact that the transmission mechanism is cut loose entirely by means of free wheel, H. Eighth. The time necessary for changing the speed of cam shaft is considerably less because of the more convenient location of change gears, F. Ninth. The oil pump is driven at a constant speed. Finally. Control of hand and power movements of the cam shaft mechanism as well as the flow of oil is brought within easy reach of the operator while in a position to observe the action of the tools.



Motor-driven Automatic Machine.

The system of gearing shown is so designed that it is practically noiseless.

These changes in the mechanism of the machine make the work of operating it much lighter than formerly.

NEW AUTOMATIC GEAR HOBBING MACHINE.

The accompanying illustration is of a new automatic gear hobbing machine about to be placed on the market by the Adams Co., Dubuque, Iowa. It is claimed by the manufacturers that this machine will cut accurately and economically a large percentage of the gears used in manufacturing; and that by equipping the machine with a full set of change gears and a full set of hobbs, it will be complete for all sizes and pitches of gears up to its capacity of 12-inch diameter and 6-inch face.

This capacity will cover nearly all of the requirements for automobile transmission gears, lathe, boring mill, milling machine and other machine tool change gears, drill press and other back gears.

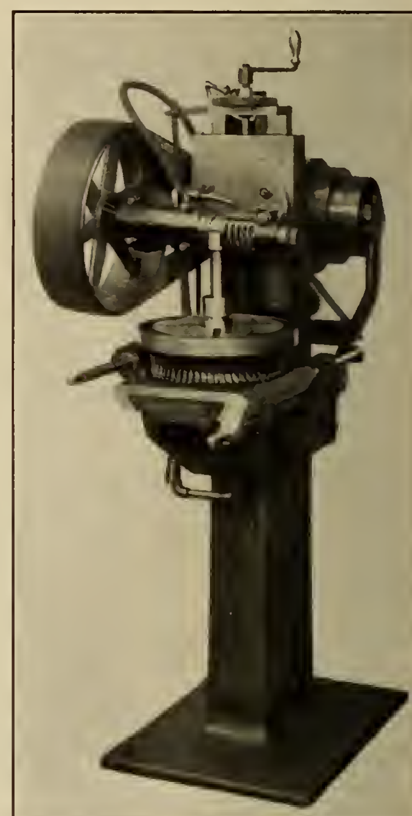
One hob is required for each pitch desired. One hob of the desired pitch will cut gears with any number of teeth up to the full swing of the machine table (12 inches). The same hob will also cut worm gear wheels.

The spindle is driven by a 4-inch belt on a 15-inch diameter pulley from a swinging cone pulley shaft and the drive belt is kept taut in all positions of the spindle head by a distance rod provided with turn buckle for adjusting. Three hob speeds are obtained by the three step cone pulleys for $2\frac{1}{2}$-inch belt on the swinging shaft and countershaft.

The countershaft is provided regularly with one 4x10-inch friction clutch pulley. Two pulleys may be provided where more spindle speeds are desirable, but as the hobs do not vary greatly in diameter three spindle speeds are deemed sufficient to take care of the requirements.

The spindle head is swivelled upon the saddle so that the hob may be set at the proper angle for cutting spur gears with different pitches or for cutting worm gears. This saddle is gibbed to the slide on the column for providing vertical feed.

The hobs for cutting spur gears are regularly right-hand, single thread, 3-inch diameter, 3-inch long, with $1\frac{1}{4}$-inch arbor hole and $\frac{1}{4}$-inch key-



New Automatic Gear Hobbing Machine.

way. Other sizes, of course, may be used. The hob may be moved lengthwise so the entire length of hob can be used before requiring sharpening.

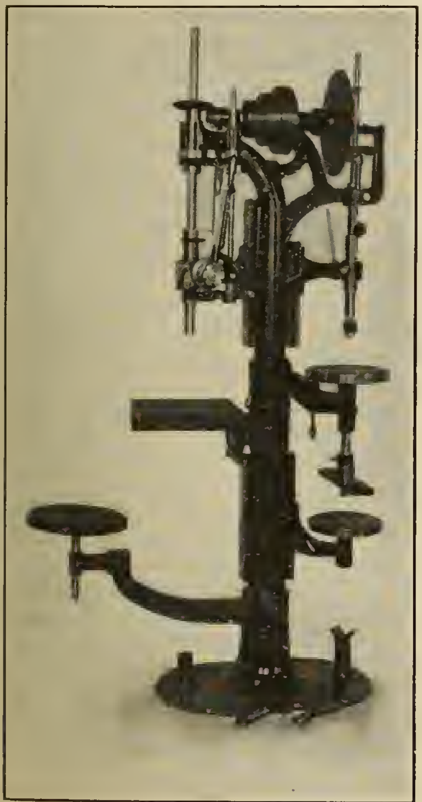
The table revolves upon a wide angular surface that gives the table great rigidity. A small plunger pump forces a stream of lubricant upon the cutter and work when desired. The knee that supports the table saddle is hollow and forms a tank or reservoir for the lubricant. Holes through the table hob conduct the lubricant back to this reservoir.

The table is revolved at the proper speed (varying according to the number

of teeth in gears to be cut) by means of one pair of bevel gears at the spindle head, one worm gear at the table and one pair of spur gears connected to bevel gear by universal jointed rod.

There being a small number of joints and all gears and shafts being large, there is insured a very steady positive drive of the table in unison with the cutter, which is very essential for accurate work. Usually one only of the spur gears is changed when the number of teeth to be cut is changed.

The vertical feed is by means of a pawl and ratchet operated through a reducing gear by an eccentric on the worm shaft. The feed may be changed without stopping the machine by shifting the



Combination Drill Press.

button on the bell crank at the top of the machine. A trip automatically stops this feed when the hob has finished the gear.

No attention is required by the operator other than putting on blanks and taking off finished gears. One operator may run several machines or attend this gear cutter while operating other tools.

A rigid stop is provided, against which the table saddle may be run, to give the proper depth of the teeth. Instead of setting this stop by micrometer graduations which require much care in setting, a hardened steel gauge is provided which is of a thickness equal to the depth of the teeth of the pitch desired. To set the stop, the table is advanced until the blank contacts the hob. The stop is then screwed up against the gauge block. When the gauge block is removed and the table is advanced to stop, the correct depth is obtained. After the stop is set for a given diameter, any number of gears of same size are cut the proper depth by simply moving table to this rigid stop. A careless operator cannot spoil work as is often done when depth is set by micrometer gauge.

COMBINATION DRILL PRESS.

This is a rather novel combination, as it includes a sensitive drill and a hand or power-feed gear drill on the same frame, so that either or both can be used at the same time. The sensitive drill is driven by a friction disk and will drive a 3/8-inch drill while the other side handles anything up to 1 inch. This can also be used as a knee feed in which the operator's knees come under the crossbar attached to the lower end of the cable spindle and feeds the work against the drill leaving both hands free to hold the work. A stop is provided for this work. Or this can be swung out of the way and a much greater distance between the drill and the table secured by using the lower table which is on the dove-tailed slide on the face of the column. This table can be used on either side of the drill by transferring it to the opposite face.

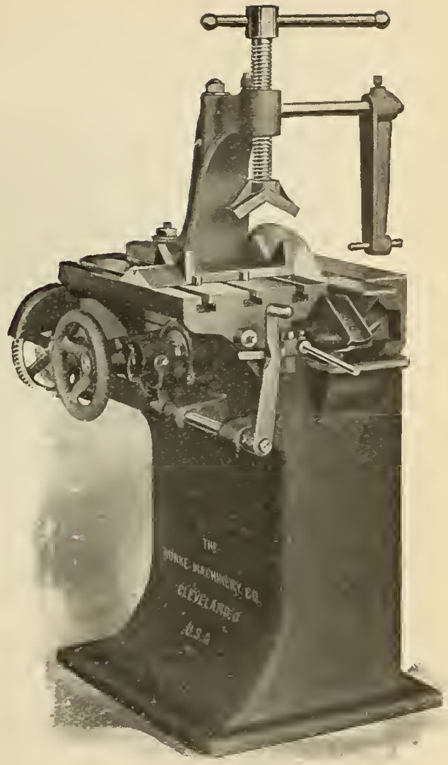
Under the geared spindle of the drill is a 13-inch square table which can be swiveled or the other table can be swung around under this drill should it become desirable as both of these swivel on the round column and can be moved in any desired position. The same is true of the operator's seat and in either position it saves the time often spent in hunting up a box of the right height.

The drill will accommodate work up to 14 inches in diameter on either side as the centre of the spindle is 7½ inches away from the face of the column. The fixtures shown on the base are convenient in drilling long stocks and particularly for centering it. On shorter work the cup centre can be placed in either the upper or lower arm under the sensitive drill and adjusted to suit almost any length of work that will be handled. This machine is made by the Lapointe Machine Tool Company, Hudson, Mass.

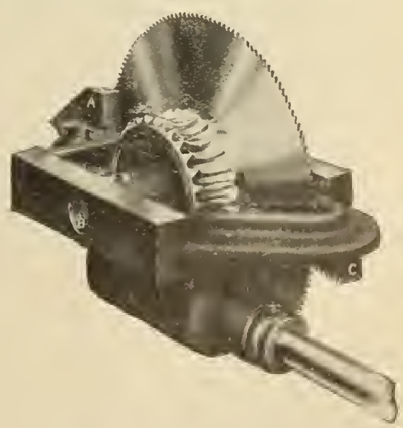
NEW METAL SAW.

The makers had two objects in view in designing the saw shown in the two accompanying illustrations, low cost and to furnish a saw complete in all detail and yet not complicated.

Principally, the machine consist of a main frame containing a suitable guide-way through which travels the saw carriage. In this saw carriage is mounted a worm wheel and worm, and the saw itself is bolted directly to this worm wheel, the loose shaft 'B'' holding the worm wheel in place. On the front of the saw carriage is the hardened steel casting ''A'' which acts as a guide plate for the saw, and at the same time as a stripper to carry away the chips from the saw. The worm wheel shaft is driven by means of a key mounted in a suitable gear sleeve which is mounted on the rear end of the frame, this gear meshing into a pinion in one end of which is mounted the driving pulley. This same pinion actuates a system of gearing driving a worm shaft on the outside of the machine, this worm shaft through its worm engaging in a worm wheel having square jaws cast on one side. Through a sliding clutch engaging in these teeth, a cross shaft is operated having at its end a pinion en-



New Metal Saw—The Machine.



New Metal Saw—The Saw and Carriage.

gaging in the rach "C" which is mounted on the lower side of the saw carriage.

At the front of the machine is mounted a suitable lever which actuates the outer part of the clutch, this clutch being held out of position by a suitable spring. When the saw is running and this lever is pulled over until the clutch engages, the lever is caught by a catch on the front of the machine. Through one end of this catch is mounted a short rod which can be set at any point desired, and the clutch is automatically tripped by the carriage coming in contact with the end of the rod which throws out the catch holding the lever in position.

Intermediate between the driving pinion and this feed worm gear shaft, is mounted a gear held in position by suitable flanges lined with leather and a spring mounted on the shaft carrying these flanges gives the necessary tension to this friction drive. A suitable handnut increases or diminishes this tension as is needed.

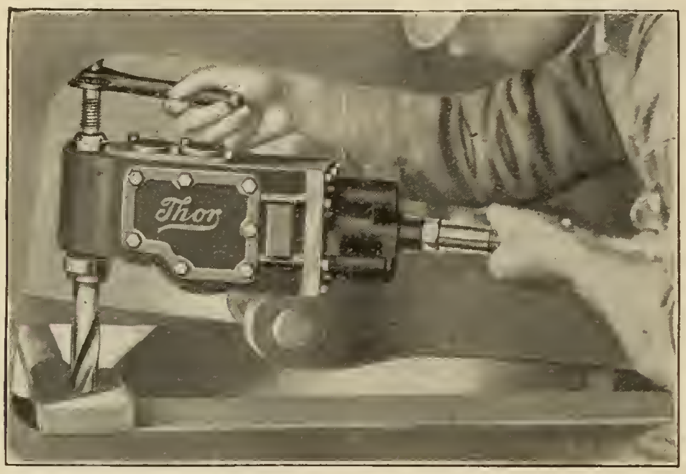
The saw carriage travels over an oil pan cast in the frame of the machine which permits one inch of the blade to be immersed at all times in the oil.

The smaller size which we are now making will cut three-inch round or five-inch "I" beams, having a maximum capacity of three by five with a nine-inch travel to the saw blade, so that on flat stock it will cut nine inches wide. A guide block is furnished for small rounds or squares which sets in the "T" slots on the top of the machine and a suitable clamping device for holding the stock in position is furnished.

The saw is made by the Burke Machinery Co., Cleveland, Ohio.

CLOSE-QUARTER PISTON AIR DRILL.

About six months ago the Independent Pneumatic Tool Company, of Chicago and New York, placed on the market an air drill designed for use in extremely close places, being capable of drilling up to 2 inches in diameter and reaming and tapping up to $1\frac{1}{4}$ in. in diameter, which can be operated within 1 5-32 in. of a corner. This drill has met with remarkable success, and in response to a demand for a similar machine adapted to heavier work, the company has just brought out another close-quarter piston air drill for such purpose.



Close Quarter Piston Air Drill.

The spindle is at one extreme end of the tool and the motor is at the opposite end. The motor consists of two cylinders parallel with each other, and in right angle to the spindle, centre line of both cylinders centres on centre of spindle. The pistons are double acting and operate on a two-throw crank. Between the crank throws at the centre are located the eccentrics, cranks and eccentrics being one forging. The eccentric straps operate directly on balanced cylindrical piston valves, having a reciprocating motion. The air is taken in centrally between the cylinders, and the valves control the air as close to the cylinder bore as material will permit. Geared to the crank shaft proper is another two throw crank, diametrically opposed. This crank operates direct on two oscillating levers, centred on the drill spindle proper and having their bearings around the same. These levers are provided with pawls of practically the whole thickness of the lever. The pawls operate on ratchet teeth sunk in the spindle, the outer circumference, or point of teeth leaving ample stock for bearings of the levers. The lever operating crank is arranged to have its power stroke on the part of the revolution farthest away from spindle. It therefore makes the speed of lever more uniform, pulls forward considerably more than its half revolution and returns quickly to action. The crank being opposed, the motion of the drill spindle is continuous, with only slight variation. The engine crank proper is not on the usual ninety degree angle but has an angle of one hundred and thirty-five degrees, thus allowing two pistons to pull when the position of levers requires the greatest power. This makes the drill in a degree self regulating and tends to still further govern the speed of the entire revolution of drill spindle. This drill is provided with the reversible ratchet feed mechanism, operated within the width of the body of the drill itself. A poppet valve throttle controls the speed and power to a nicety, and also acts as a handle.

A PIPE DIE STOCK.

In this die stock the cutting edges of the chasers are considerably shorter than usual, but as they advance upon the pipe they are automatically expanded and in this manner they produce a correctly tapered thread necessary for tight joints. The short chasers, everything else being equal, require less power than those of regular length; they have the further advantage in this die of being easily removed and ground.

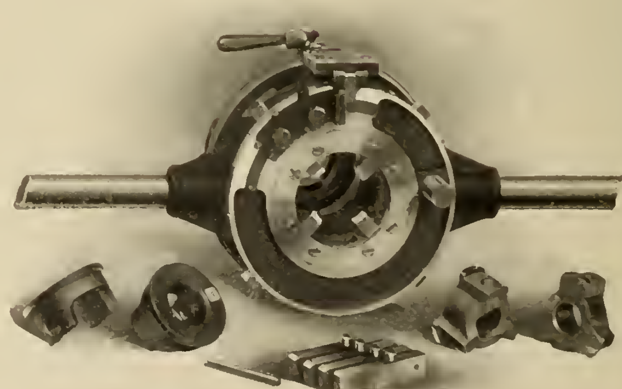


Fig. 1—Hart Pipe Die Stock.

In this stock there is no threaded leader, instead, a face cam is used for this purpose; its position is shown in Fig. 2 at A, the pin B working on its inclined face, as the die is rotated, draws the chasers to the pitch. The threads

start without any extra exertion on the part of the operator and through the employment of the cam leader the tool is not limited to threads of the same pitch nor to the one direction of lead, as with

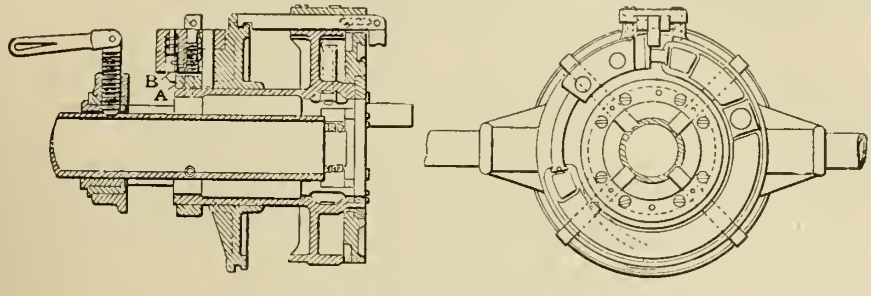


Fig. 2—Cross Section of the Hart Die Stock.

it both right and left-hand threads can be cut.

The dies and stock are so constructed that a number of sizes may be cut with the one set, as, for instance, with that shown all pipe sizes from 1 inch to 2 inches inclusive.

In Fig. 1, in front and to the bottom of the die head, the cutting-off attachment is shown. By means of it pipe may be cut off rapidly and smoothly without burs. The head is provided with pockets into which the oil, injected to the dies, lodges and from which it drips to the work as the die is rotated. As soon as the dies have been screwed onto the pipe far enough to complete a thread of sufficient length they stop cutting and release themselves from the work. A slight turn of the controlling cam plate by hand then enables the dies to clear the threads and the die is removed from the work. In proceeding with the cutting of a duplicate thread the dies are instantly reset by turning the cam plate till the stops touch.

Fig. 3 is a side view of die stocks, showing leading device. Fig. 4 shows cut-off attachment.

This die is made by the Hart Manufacturing Company, Cleveland, Ohio.

SOLDER CAP HEMMING MACHINE.

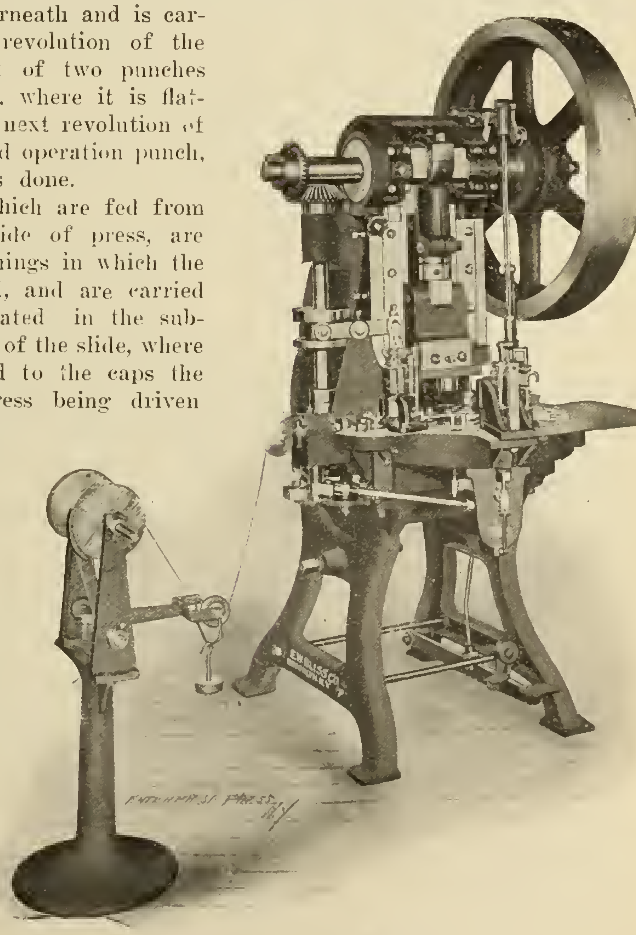
The accompanying illustration shows a new design solder cap hemming machine recently built by the E. W. Bliss Company, 20 Adams Street, Brooklyn, N.Y., U.S.A. The machine is the result of much study given to the subject, and it embodies the latest and best improvements that experience in designing and operating this class of machinery has suggested. The machine is entirely automatic, cutting, forming and attaching the solder to caps for fruit cans, after which the finished cap is positively removed, it only being necessary for the operator to place caps in the bushings of the revolving dial plate. While the operation of the machine is entirely automatic, it is nevertheless very simple. From the spool placed on the reel shown at the left hand side of the press, the wire is fed by means of feed rolls, which are operated by means of a Geneva wheel which is driven by the vertical shaft on left side of machine operated in turn through the bevel gears shown on end of crank shaft. The feed rolls are adjustable, so that by a slight turn of a lever the rolls can be either engaged or disengaged. Passing through the feed rolls the wire is fed into the first operation die which is operated by toggles driven by a race cam fastened to the vertical shaft. Here the solder is cut off to length and formed into a circle after which it drops into the dial bushing directly underneath and is carried with the next revolution of the press under the first of two punches carried by the slide, where it is flattened, passing on the next revolution of the press to the second operation punch, where the forming is done.

Next the blanks, which are fed from the table at right side of press, are dropped into the bushings in which the solder ring is formed, and are carried under a punch operated in the sub-press directly in front of the slide, where the solder is fastened to the caps the punch of the sub-press being driven from the vertical shaft by means of a cam through toggles and a connecting rod.

The cap now having the solder attached is raised flush with the top of the bolster by means of a positive knockout. While in this position a positive sweep acts and throws the finished cap into a receptable conveniently placed to receive it. A positive knockout return rod insures the return of the pads in the bushings to their proper position before the bushing passes under the first operation die in which the solder is cut and fed.

In designing the machine consideration was given to the fact that possibly the operator through neglect might not feed caps into the bushings, into which the solder had previously been deposited, so to avoid the possibility of feeding two pieces of solder for one cap the press is arranged to automatically stop in the event of the operator failing to place a cap in each bushing, and overcomes the consequent risk of injuring the closing punch. It also has a tendency to keep the operator alert, for as soon as the feeding is stopped the press stops. The dial is driven by a Geneva wheel, and to insure against any possible accident in case of the dial not registering accurately the press is fitted with a safety stop connected with the clutch. In the event of the dial not registering accurately, this stop is arranged to act on the clutch and immediately stops the press.

The press has a capacity of 75 caps per minute, and weighs 2,500 pounds, as shown.



Solder Automatic Hemming Machine.

FOUNDRY PRACTICE AND EQUIPMENT

Practical Articles for Canadian Foundrymen and Pattern Makers, and News of Foundrymen's and Allied Associations. Contributions Invited.

METAL MARKETS DURING MONTH

The metal markets cannot be said to be as strong, so far as prices are concerned, as they were a month ago. Tin, lead and spelter have all declined, and although copper has held firmly in New York, severe fluctuations have occurred in London. Despite the fact, however, that quotations are lower, there seems to be a brighter tone to the markets than there was last month. The brisker movement of trade, the evident signs that the States are beginning to throw off the depression, and the returning confidence of English capitalists in American railroad bonds, as shown by the over-subscribing of the 20 million dollar Pennsylvania 4 per cent. bonds, allotted to the English market, have induced a greater feeling of confidence in the future.

The great stimulation in demand that should have arrived a long time ago, if experts had been correct, has failed to make its appearance, but despite this, there is still the belief that the great turn may come at any moment. It is probable that the revival will be along the lines of slow but steady progress, which makes for stability, and that there will be no sudden great boom in demand. After all considering the metal situation as it stands to-day, and what it was like at the commencement of the year, it cannot be said that there has not been steady improvement. The demand really has been better than many have imagined, although the average order not being of a bulk that commands ready attention and has immediate effect upon market, the aggregate consumptive demand has been somewhat minimized. Judging from the way the markets have held in the face of the dull conditions obtaining, and the hammering of speculative interests, buying in a small but steady way has not been so poor after all.

Although, therefore, the markets at present, so far as quotations are concerned, are not on the surface so strong as they were, and this is largely owing to breaks in market manipulation, the situation is not really weaker. Rather, in view of the returning confidence of commercial men in the States, the outlook is more favorable.

In the same way this applies to Canadian markets. With the opening of navigation, with seeding reports from the Northwest so favorable that a great and glorious harvest is anticipated, and with renewed activity in the industrial community, there is a more hopeful feeling in the metal markets. The demand generally is fair, and since the opening of navigation orders are increasing in bulk.

Tin has come down like a skyrocket in the primary markets. This was anticipated in the last issue. For the time being the great bulling movement in the English market has broken. The falling away of the New York demand—the great tin plate firms having all the metal they want at present—and the continuance of the poor domestic demand, proved too much for those who have been bulling the market, and prices gave way. The extent of the decline can be seen from the fact that at the close of April, tin in the English market was at £144 5s, at the time of going to press it was around £133 10s. Naturally the New York price has gone with the decline. Canadian quotations have eased, and the market is now at $33, a decline of $1 from last month. The Canadian demand generally has been fair.

Copper has kept remarkably steady Despite fluctuations in the English market, the New York market has not been affected, which shows that the domestic demand is stronger than it was. Not so long ago owing to European users being the mainstay of the market, prices were directly swayed by London. With a stronger domestic demand, New York prices are holding, despite English fluctuations. Locally, quotations are from $13.50 to $14, a shade weaker than last month's quotation.

Weekly shipments from the Old Country in iron and steel are now arriving and the Canadian market is much stronger. The lower prices now in force, in consequence of the opening of the St. Lawrence, have stimulated business, and some fair orders have been booked. With an anticipated strong demand for steel later on, prospects are very favorable. There had been a big jump in English pig iron apparently due to some strong manipulation going on. Prospects, however, so far as the English market is concerned, are not so good as they were, owing to the dispute in the shipping industry threatening to become very serious. Steel prices are being maintained in the States, but there is cutting going on among the pig iron producers. The market is unsettled, and very nervous.

Lead has continued to fall away under a poor demand, and prices have been cut in the English market. A slight rally has taken place again, which may or may not conduce to stronger figures. Imported lead is quoted here at $3.80, a decline of 20c on last price.

Spelter has not recovered from the setback which it experienced last month from second-hand offerings, and prices in London have continued to fall. With a firm demand, Canadian quotations have remained at $5, with shading for good round lots.

THE COVER DESIGN.

No doubt our cover will attract considerable attention. It is a work of art; yet at the same time represents true to life a scene in the Canada Foundry, Toronto, of open molding. The piece being molded is a bedplate for the pipe foundry. This method of molding these bedplates has given excellent results in this foundry.

TARIFF ON FIRE BRICK.

According to a recent decision of the Canadian Customs Commissioners, fire brick (9 in. x 4½ in. x 2¼ in.) valued at over $13 per thousand at place of export are to be admitted free under tariff item 281 until otherwise ordered, but fire brick valued at $13 per thousand and less at place of export, are held to be made in Canada and subject to duty under tariff item 282—in effect from May 1. Locomotive fire brick (arch blocks, fire box blocks, boiler tile) and fire brick for stove linings are made in Canada and importations thereof are rated for duty under tariff item 282. It is further noted (a) That importations of above described fire brick as rated for duty under tariff item 282, are rendered subject to special or dumping duty in cases where the true selling price (f.o.b. place of shipment) to the purchaser in Canada, is more than 7½ per cent. lower than the value of the same for duty purposes, and (b) that fire clay gas retorts, hollow shapes, and hollow blocks, although made of fire clay, are rated for duty under tariff item 282.

Molding Machine Practice in a Canadian Machine Foundry

Showing the Increase in Output and Saving in Cost in a Large Machinery Foundry Affected by the Use of a Simple Type of Molding Machine.

The accompanying illustrations are of molding machines as used in a large Canadian foundry where the output of the foundry has been greatly increased by use of molding machines. The name of this foundry, as well as the name of the several patterns, have been suppressed at the request of the firm owning the foundry. However, this does not take away from the value of the article in showing what has been done with molding machines in this shop.

In the accompanying table, Fig. 1, the various patterns upon which hand and machine work are compared, are designated A, B, C, D, etc., instead of being named. A very good idea of the class of pattern can be gained from the weight of the casting. A perusal of the table will show readily how the foundry superintendent was able to increase the output of the foundry.

Example.		Number of Patterns in Mold.		Price Paid per Mold.		Number of Molds for Day's Work.				Cores to Set Each Mold.		Net Weight of Castings per Man.	
Patern Number	Weight of Casting	Hand	Machine	Hand	Machine	Men Hand		Men Machine		Hand.	Machine.	Hand.	Machines.
A	1 lb.	9	12	7 c.	4 c.	1	45	1	80	9	12	405 lbs.	960 lbs
B	¾ "	9	22	7 "	4 "	1	45	1	85	None	None	303 "	467 "
C	80 "	1	1	42 "	22 "	1	8	2	36	5	5	640 "	1440 "
D	105 "	1	1	45 "	14 "	1	8	2	56	7	7	840 "	2940 "
E	90 "	1	1	50 "	25 "	1	7	2	26	5	5	630 "	1170 "
F	8 "	1	2	7 "	6 "	1	45	1	80	1	2	3·0 "	1280 "
G	1 "	9	9	6½ "	3 "	1	50	1	115	None	None	450 "	1035 "
H	7 "	1	4	7 "	6 "	1	45	2	135	1	4	315 "	1890 "
I	6½ "	2	4	6½ "	5 "	1	50	2	150	2	4	600 "	1800 "
J	2 "	6	6	7 "	5 "	1	45	2	140	12	12	540 "	840 "
K	1 "	4	12	6 "	6 "	1	55	2	125	2	12	220 "	750 "
L	1 "		24	6 "	4 "	1	55	1	85	None	None	495 "	2125 "
M	21 "	1	1	15 "	6 "	1	25	2	125	1	1	525 "	1312½ "
N	175 "	1	1	50 "	20 "	1	7	2	30	4	4	1225 "	2625 "

Fig. 1.

This foundry is a machinery foundry where yearly contracts are made for castings. The machine is a simple and cheap yet accurate draw-down machine, the patterns being stripped thus, the ramming being done by hand.

The four illustrations are fairly representative of the practice as conducted on these machines, and serve to show the different methods of mounting the patterns on the machines. The casting produced is shown in each case.

Saving of $7.11 Per Day on T Connections.

The pattern, mold and casting, shown in Fig. 2, is an ordinary valve or T connection for pipes, stripped or drawn through a plate leaving the mold resting on the plate. This is the most accurate method of drawing a pattern and the one generally used; but on this machine a number of foundries do away with the stripping plate entirely. They simply secure the half patterns on a plate, and

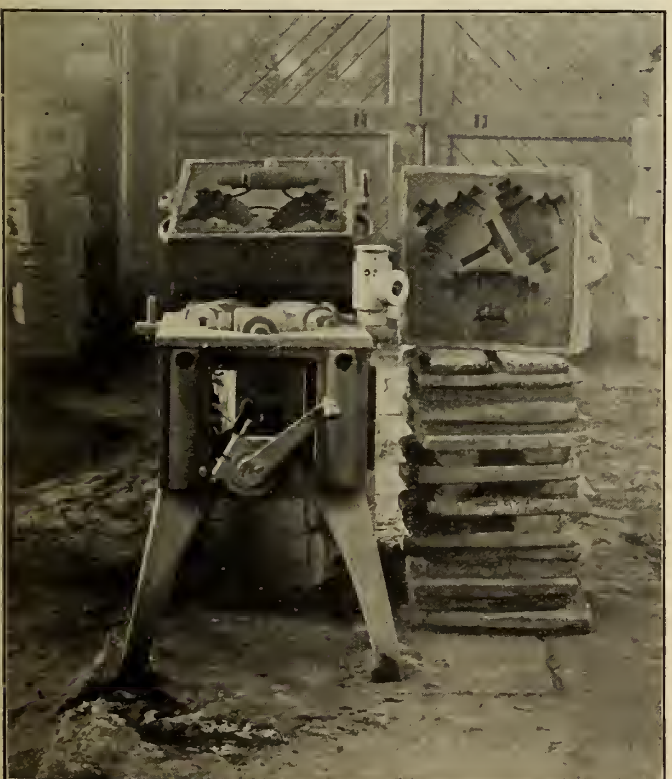


Fig. 2.

Fig. 3.

having a frame to support the flask, they draw the plate through the frame. This method is much cheaper and better for jobbing foundries where only a few hundred castings are wanted at a time. In this case wood plates and frames are used.

At the back of the machine is shown the drag with one core in place. To the right is the cope, which is rammed on a second machine, in order to allow two men to work together, one ramming the cope and the other the drag.

This casting ready for shipping weighs 7½ lbs.

On the bench, a molder used two patterns in a snap flask, being paid 6½c per mold, and put up 50 molds for a day's work. Three patterns were mounted on a machine using a 13-inch x 13-inch x 5-inch cope, and 5-inch drag, iron flask, and two "handymen" were trained for the machine, putting up 150 molds at 5c per mold. Taking the molding price per hundred castings we have by hand molding, $3.25 per hundred, as against $1.66 2-3 per hundred on the machine, which means a saving of $7.11 per day in this case.

Machine for Deep Draw Pattern.

In Fig. 3 is illustrated a pattern with a deep draw. The machine shown is designed for pulleys, etc., and has a 10-inch draw, and it can be used to make pulleys having a maximum face of 20 inches with any intermediate width, the diameter being regulated only by the width of the machine.

The casting is seen on the left, and only one machine is used, for the drag, the cope being rammed on a dummy plate, thus saving the expense of a second machine, and cost of mounting. The hub, arms and feet of this pattern are made in one piece and the feet are drawn through the flange, which is part of the stripping plate. This plate extends inside between the feet and arms and does away with the ordinary "stooling" for this class of work.

This pattern has only recently been mounted and has not been run for a full day's work, only a hundred or so having been made from the machine. The hand molding price was 25c piece work, while on the machine it pays 10c. The casting weighs 32 pounds.

In Fig. 4 is shown a pattern which, when mounting, the centre had to be supported by "stooling"; so that in stripping or drawing the pattern two plates are used, the inside one being supported by four stands resting on the bottom of the machine.

Another feature on this pattern is that only one-half pattern is used for both cope and drag, thus saving one machine and one-half pattern. Each half of the mold has six cores, those in the cope requiring to be secured in order to stay in their place, while closing.

The piece-work price on this pattern by hand was 50c, and a man had to work hard to put up 7 molds; while on the machine, the price is 20c, and two handy men put up 35 for a day's work. The orders on this casting come in to the foundry from 50 to 100 at a time only, and it has already paid for the machine and patterns in the saving of the time of delivery, as well as the molding price.

Use of Snap Flask; Uneven Joint in Casting.

In the previous illustrations iron flasks are used on account of the sizes of the job and weight of metal in each mold when pouring. In this case, however, Fig. 5, we have a 14-inch x 14-inch snap flask used with these patterns, the casting only weighing about 2 lbs. each. We have here also a very uneven joint, and the outside of the pattern only is stripped, the inside being drawn away from the mold, and this requires a machine with a perfect draw, as the slightest lateral motion in drawing the pattern will result in knocking the sand away from the inside. Two machines are required for this pattern, the drag being shown with mold rammed up and lifted off. While the cope part of the mold is seen at the right. The two castings serve to show both sides and the uneven joint referred to.

Four patterns on a gate paid 7c per mold, and 50 to 55 molds were put up for a day's work; but the castings were unsatisfactory on account of the rapping of the patterns so much to get a good lift. As shown four patterns are used on the machine also, but as no rapping is done, the results are much better, the castings more uniform. Two men put up 150 molds per day at 5c per mold.

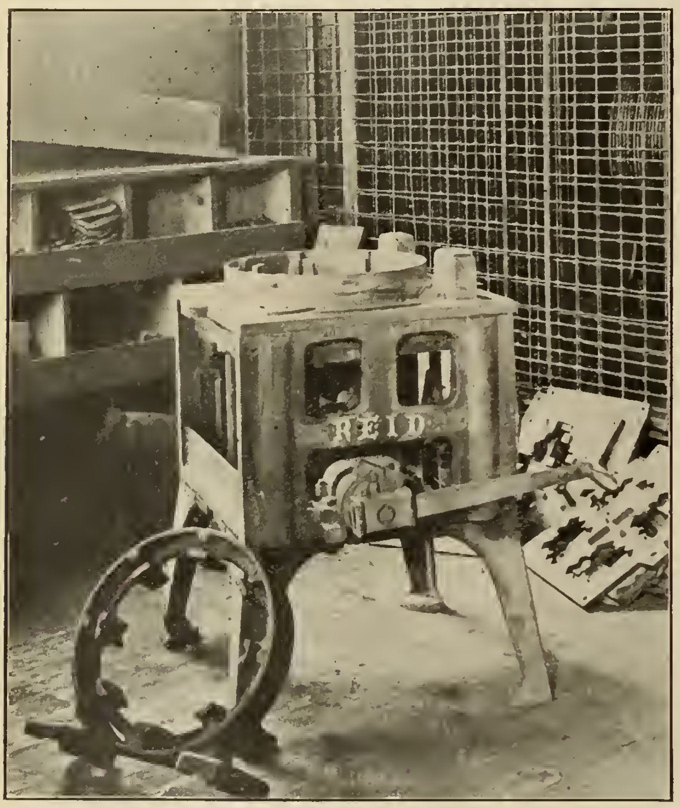


Fig. 4

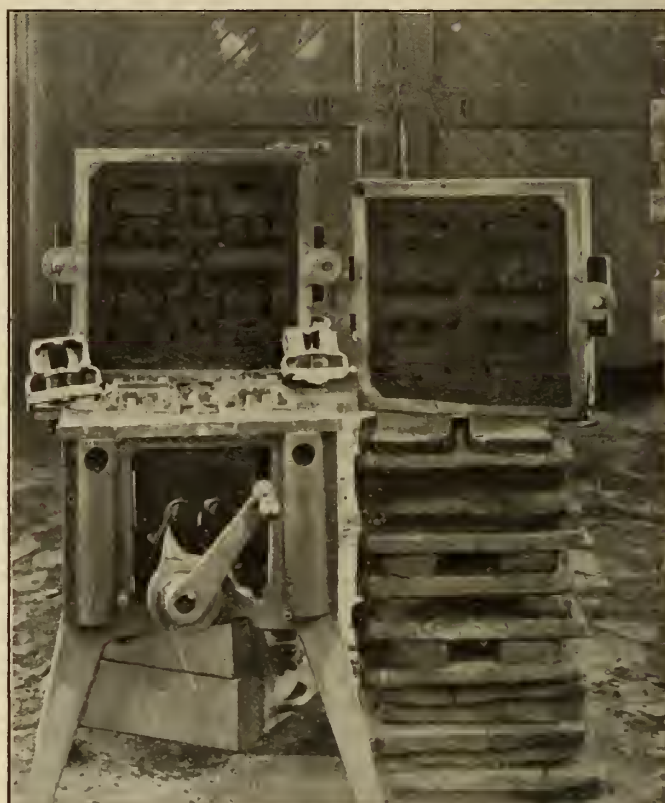


Fig. 5.

Welding Steel Castings: A Simple and Reliable Method*

Little Equipment is Needed ; The Author has had Much Satisfaction in Repairing Cast Steel Motor Frames ; Can be Adapted to Any Line

By C. B. AULL

One of the most important developments within the last few years in the mechanical design of machinery of all kinds is the progress which has been made in the use of cast steel. At first used sparingly for large castings of comparatively simple design and where exceptional strength was needed, its use has extended to castings of small size and complicated shape and in many instances it is chosen for the purpose, not of procuring exceptional strength, but of obtaining castings of comparatively light weight for a given service.

It is more difficult to obtain a sound steel casting than it is one of iron. No matter how much care is taken in the preparation of moulds and in the pouring of the castings there is a liability of blow holes and mis-running at the high points in the mould which results in a comparatively large percentage of scrap. In the majority of instances these defects do not appear on the surface and both time and money is lost in machining before the defect becomes evident. Furthermore, it is usually the case that manufacturers are not provided with their own steel foundries, even though they may be equipped for the making of iron castings, hence there is a greater delay incurred in replacing a defective steel casting than is necessary in the case of a defective iron casting.

For this reason the following description of a simple welding process should prove of value and interest to all makers and users of steel castings:

The method described involves very little special equipment, and its cost of installation is small compared with the saving in time and expense which result, provided there is sufficient work to keep the plant occupied. Not only is there a material saving in the replacal charge for scrapped castings, but one of the most important benefits is the ability to put the castings into useable shape, thus avoiding the delay incident to replacing them.

Furthermore, it is evident that the process, as described, is adaptable to many other uses than that which has been described.

There are several distinct processes of electric welding in use at the present time, these being named, if not from the original investigators, at least from those who had most to do with demonstrating their feasibility; namely, Zerener, La Grange-Hoho, Thomson and Benardos.

In the Zerener process an arc is drawn between two carbon electrodes and caused to impinge by means of an electro-magnet upon the metal to be welded —this process is sometimes known as the electric blowpipe method.

The process credited to La Grange-Hoho, otherwise called the "water pail forge," makes use of a wood tank filled with a suitable fluid into which is placed the positive terminal of an electric circuit. The metal to be forged or welded is connected to the negative terminal, dipped into the fluid and held there until a welding temperature has been reached. It is then removed and the forging or welding completed under a hammer in the usual manner.

In the Thomson or 'incandescent" process, the metals to be welded are brought into intimate contact with each other, being thus held by metallic, spring-actuated clamps and in this position, completing an electric circuit. The resistance at the point of contact between the metals is such as to produce a welding temperature in a very few seconds, when the two metals are then further forced together automatically, and welded in so doing.

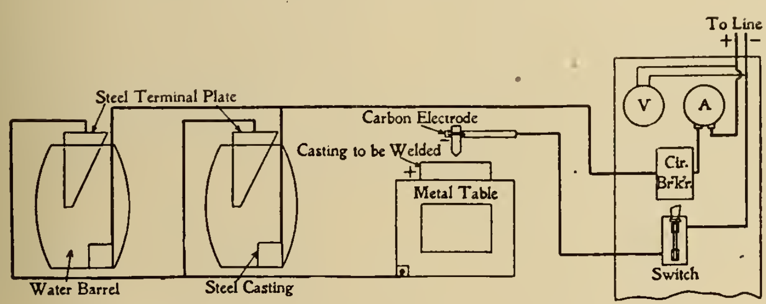


FIG. 1—DIAGRAM OF CONNECTIONS FOR ELECTRIC WELDING OUTFIT

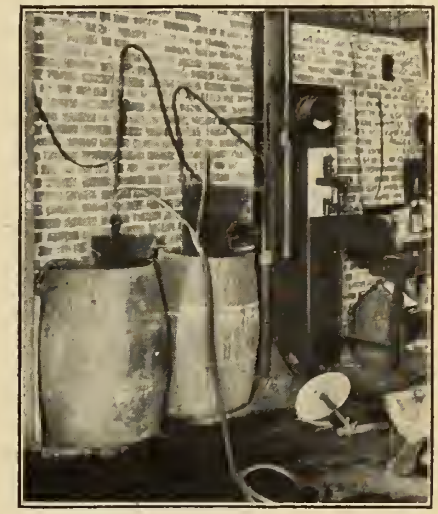


Fig. 2—Water Rheostat and Switchboard.

In the Benardos process an arc is drawn directly between the metal to be welded, which forms one terminal of an electric circuit, and a carbon electrode, which forms the other terminal.

It is the purpose to describe here in detail but this last mentioned process and only its application in connection with steel castings, pipes and plates, though it has a considerably wider range of usefulness.

Apparatus.

The outfit required for the welding of steel castings includes a direct-current source of supply, a rheostat, a carbon electrode and fire-clay or carbon blocks for moulding purposes. An enclosure should be provided in which to carry

Fig. 3—Carbon Terminal.

* From the Electric Journal. This process is in use at the plant of Ontario Iron & Steel Co., Welland.

on operations, for the glare from the arc is very intense and would seriously interfere with any other work in the immediate vicinity. The operator should have all parts of his body well covered (the clothing is quite sufficient), as even a few minutes' exposure to the rays will produce an irritating effect like sunburn upon the skin, resulting in a reddening and subsequent peeling of it with, however, no more serious consequences. For the head a canvas hood is generally used, being fitted with a small window of colored glass, through which the welding operation is watched without risk of injury to the eyes. The hands are usually protected by buckskin gloves provided with gauntlets to cover the wrists.

Current may be obtained from a 100 to 125 volt supply circuit or from an independently operated dynamo, or from

Fig. 4—Workman Repairing Motor Frame.

a battery operated in conjunction with a dynamo or other supply circuit. An even higher voltage, say 220, may be used, but it is very wasteful of energy. Assuming that there will be sufficient welding to keep at least one man steadily employed, and taking into account the relative advantages and disadvantages of each of these several sources of supply, including first cost, subsequent maintenance, continuity of operation, simplicity and non-interference with other portions of the electrical plant, an independently driven dynamo is perhaps to be preferred. It is of the utmost importance that the supply be of ample capacity, for more failures may be traced to an inadequate supply than to any other one cause. The dynamo should, therefore, be of about 75 to 100 kw capacity at 100 to 125 volts, shunt or compound-wound, belt driven or direct connected; if the latter, a flexible coupling must be used, otherwise armature burn-outs are likely to be of frequent occurrence. With the dynamo should be provided a small switchboard having mounted on it the necessary instruments, voltmeter, ammeter, circuit breaker, field rheostat and switch. If the dynamo is driven by a motor instead of by an engine one or two additional instruments will be required for the control of the motor.

The rheostat may be of the grid type, though a very satisfactory one is easily constructed by using two water-tight barrels placed side by side. The positive cable of the circuit is carried from the dynamo to the switchboard and from the switchboard to the water rheostat. At the rheostat this cable divides into two smaller ones, which are run down the inside of each barrel and fastened to heavy plates of steel which line on the bottom. Separate triangular steel plates not less than one-fourth-inch thick are suspended above the barrels by means of pulleys and counterweights so that the plates may be readily lowered into or withdrawn from the barrels as occasion requires. Cables are attached to these plates and these are joined to a cable, the other end of which is attached to the castings to be welded or the table on which the casting is laid. Discarded steel castings may be substituted for the steel plates in the bottom of the barrels. They should weigh about 20 or 30 pounds each and not occupy too much room. The negative cable of the circuit is carried from the dynamo to the switchboard and from the switchboard to the vicinity of the casting to be welded, where it is provided with a metal terminal and clamp, into which the carbon electrode is tightly fitted. In order to manipulate the carbon electrode during welding, the negative terminal is held in a wood insulating handle, to which is attached a shield of asbestos or other fireproof insulating material. The exact form of the terminal and clamp, the insulating handle and shield or the terminal plates of the water rheostat is immaterial, as is the method of attaching the cables to their respective terminals as long as good and sufficient contact is made, thus preventing undue heating at the joints.

The general arrangement of the circuit is shown in Fig. 1. The switchboard and the water rheostat are shown in Fig. 2 and the carbon holder in Fig. 3.

The selection of the proper carbon requires some care and while almost any kind may be used, such will not give the best results. The carbon is subjected to very hard usage, being alternately heated (frequently white hot) and cooled, this treatment having a tendency to cause it to crumble or flake and sometimes crack in pieces. The flake or pieces which happen to fall into the weld during the process are melted and mixed with the metal, thus producing a hard or high carbon steel very difficult to machine. Experience seems to indicate as best for heavy work, a hard, solid (not cored) carbon of one or one and one-half inches in diameter, six to twelve inches in length, and one that, as it wears away, leaves a round stub end and not a long pencil point. For lighter work, a carbon of smaller diameter will suffice.

In the general repair of steel castings, iron rod of about three-eights inch diameter is used for filling (Norway iron is preferable), although small pellets from scrap boiler plates or steel castings may also be used, the choice

Fig. 5—Workman Repairing a Defective Bearing Cap.

between the rod and the pellets depending, to a certain extent upon whether the weld is small or large.

Method of Making a Weld.

As before mentioned, the positive terminal of the circuit may be clamped directly to the casting to be welded, as shown in Fig. 4, or it may simply be laid upon a metal table and the terminal clamped to the latter, as shown in Fig. 5. The positive terminal is thus connected instead of the negative terminal so as to direct the flow of current from the casting to the carbon electrode, and in this way prevent carbon, when the electrode is vaporized, from entering the weld. The steel plates of the water rheostat are lowered into the barrels which have been previously filled with water, the circuit breaker

and the switch closed, when the actual welding is ready to be undertaken.

The operator places himself directly in front of the casting, holding the negative terminal with its carbon electrode in one hand by means of the wood insulating handle, and having within reach of the other hand several pieces of iron rod. He then pulls the canvas cap well down over his head as shown in Fig. 5, touches the carbon to the casting, thereby closing the circuit and thus producing an arc. As soon as the arc is sprung, the carbon is withdrawn to a distance of two inches or more (too short an arc will tend to produce a hard weld), and the arc allowed to play upon the casting until the metal commences to boil. It is advisable not to concentrate the arc on any one spot, but to give it a circular movement so as to heat the casting very thoroughly within the immediate vicinity of the proposed weld. This will tend to prevent too rapid cooling of the metal with its consequent chilling and hardening effect. The end of one of the iron rods is now placed directly in the midst of the boiling metal, where it gradually melts and mixes with it, the arc meanwhile being continued with one or more additional pieces of rod until the weld has been completed. The surface of the weld may be hammered as it cools off to produce a closer grain or to make it conform to some particular shape.

When pellets are used instead of the iron rod they are placed in the weld or cavity, a few at a time, and the arc applied, more pellets being added as the first batch is melted.

Should the part of the casting to be welded present a dirty appearance or contain slag, it should first be cleaned by means of a chisel or by the arc. In the latter case, this is accomplished by tilting the casting so as to allow the dirt or slag to drop off as fast as it melts when the arc is applied. After cleaning in this manner the casting is tilted back and the welding then proceeded with.

If possible, the weld should be made with one continuous application of the arc without allowing the casting to cool off. The reason for this is that oxide of iron (scale) will form with each cooling and if not removed will assist in producing a very hard weld, that is, one not easily machined. Where, however, it is not possible to make the weld with one application of the arc, the scale should be brushed off by means of a stiff wire brush. Hammering the weld after cooling will also very materially assist in this cleaning.

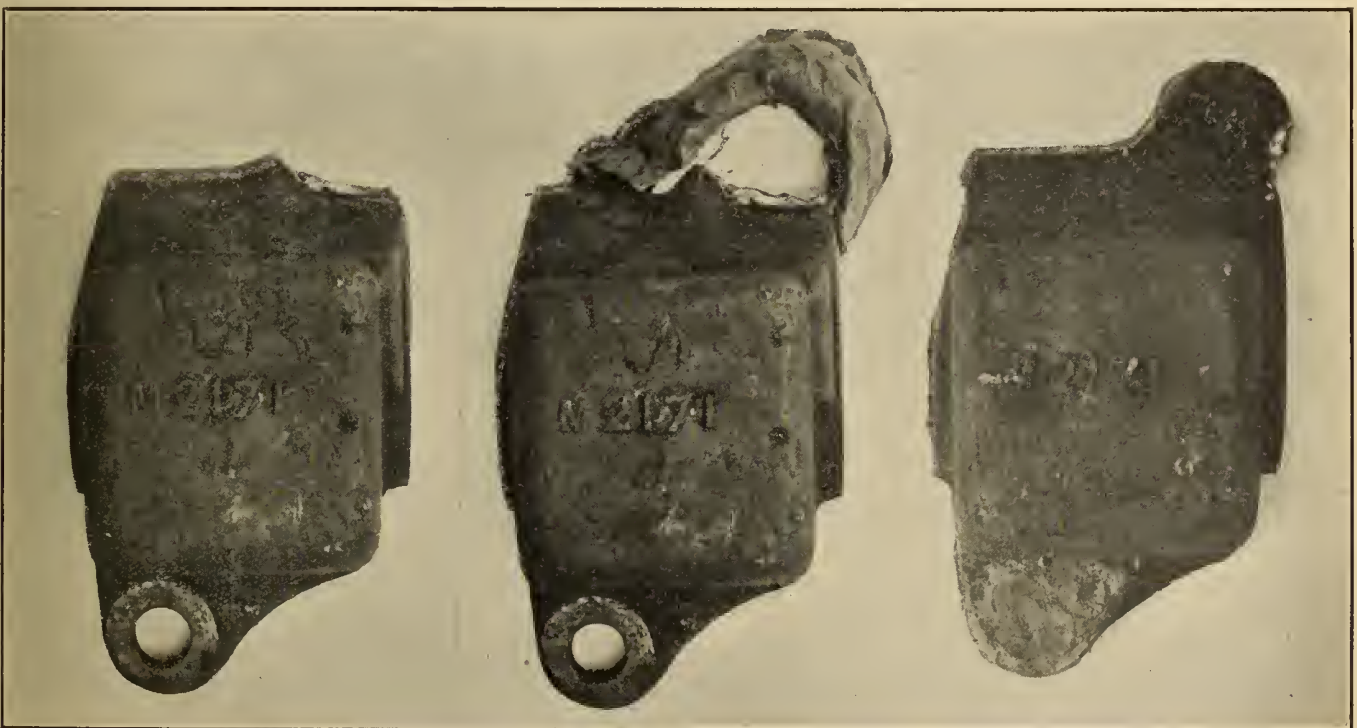
When instead of a cavity to be filled, it is necessary to build up a lug or to weld a piece to the casting, fire-clay or carbon blocks may be used for the purpose of confining the molten metal within certain desired limits or of having it assume a definite shape. The carbon clocks are generally worn-out dynamo and motor brushes and while they can sometimes be used without further dressing, being built up around the space to be filled by the metal, they frequently require cutting to shape with a knife. When fire-clay is used it is formed to shape by the hand.

A casting is shown in Fig. 6, which in the rough was apparently sound, but which on drilling and spot facing developed flaws in both lugs, one of these being spongy, the other breaking off entirely in the drilling. Fig. 7 illustrates very clearly the method of forming the fire-clay preparatory to building up a new lug, while Fig. 8 shows the casting after repairing and before redrilling.

A large motor frame casting is shown in Fig. 9. Upon removing the lower half of this casting from the sand, it was found that the strut which supports the axle lug had failed to pour, owing to the clogging of the mold with sand. A bar of wrought iron (1.5 inches by 4 inches by 14 inches) was accordingly fitted into position and welded to the casting, as shown, the whole operation being performed by one man in about two and one-half hours.

When the work is properly done, welds made by this method will give an average tensile strength equal to 70 or more per cent. of the original stock.

It would be exceedingly difficult, if not impossible, to set forth in exact terms the relations existing between current, size of weld, time required for weld, etc., on account of the different variables which enter in, but the following data, obtained in welding the spongy



Figs. 6, 7, 8.—Defective Bearing Cap, Method of Preparing Clay Mold and Cap After Welding and Before Drilling.

lug of the casting shown in Figs. 6, 7 and 8, is approximately correct and will enable a rough idea to be formed of the magnitude of the several items involved. It must, however, be borne in mind that this data represents average and not limiting values:

Line volts.	Amperes.	Volts across rheostat.	Volts across arc, including carbon
126 (open circuit)	——	—	—
102	550	36	65
102	500	36	65
102	550	39	61
98	600	42	53
97	650	44	51
97	650	45	50
102	600	42	58

Time of weld=56 seconds. Hole filled=1¼ in. diameter by 2 in.—approximately. Size of carbon—1½ in. by 6. in.

Besides the welding of steel castings

Fig. 9—Motor Frame Casting With New Strut in Place.

the Benardos process may be advantageously employed in the removal of surplus metal, including sink heads, in the boring of large holes in castings or plates, in the welding of flanges, elbows and couplings to pipes, and in a variety of other ways. It will be found, for example, that surplus metal and sink heads can in many cases be removed from castings in much less than the time required when a cold saw is used, the arc not only doing the work quicker but there being practically no time lost in setting the casting in position

In conclusion it may be stated that the Benardos process will give thoroughly satisfactory results commercially; it is one which can easily be learned by any workman of average ability, and only a few weeks' practice will be necessary in so doing. The welds first made will generally be harder to machine than the other portions of the casting, but where no machining is required, this will not prove detrimental; increasing familiarty with the process will, however, reduce the number of such hards welds to a minimum.

Foundrymen's Convention in Toronto, June 8 to 13

Many Exhibits in Machinery Hall in Actual Operation—Still Exhibits in Process Building—Interesting Cupola Exhibit — Railway Rates

The work of installing the exhibit in Toronto is already well under way. Very nearly all of Machinery Hall has been reserved, and the temporary building will be full to overflowing. The Process Building is also filling rapidly.

The cupola which is now being installed by J. de Clercy, Montreal, is sure to be a centre of attraction, as iron will be melted and poured every day. It will be located in the temporary building, where visitors will also find the oil melting furnaces and the core ovens.

Naturally, however, the systematic foundryman will wish to know how and where the molds are made before it comes to pouring.

Machinery Hall will contain molding machine exhibits by ten or twelve different firms, and core making exhibits by two firms, and possibly more. The molds made on these machines will be poured with metal from the cupola. This melting installation is of especial interest, on account of the fact that it is planned to run for an hour or two in the morning, to shut the cupola down until after lunch without dropping the bottom, and then to continue melting iron for two hours.

A plant of this kind demonstrating twice daily will be the Mecca for many manufacturers who desire a small amount of iron at intervals throughout the entire day to take care of the output of the new varieties of molding machines, which fill up the floor so rapidly that with the system now in general use of pouring all the molds late in the afternoon, the men have to carry the product of the machine a long way to fill the floor or else the machine must stand idle a considerable portion of the time. All foundrymen will appreciate the great economy of labor in pouring the molds continuously. A small cupola which can be run for the entire day giving a steady output of hot metal is something which has long been desired; then, too, the advantage of being able to shut down during the noon hour, or any desired period is a point not to be overlooked.

Other melting exhibits will be the well known tilting crucible furnace made by the Monarch Engineering & Manufacturing Co., the double chamber furnaces of the Rockwell Engineering Co., the Schwartz furnaces shown by the Hawley Down Draft Furnace Co., and the gyrating flame stationary crucible furnaces shown by Kroeschell Bros. Bros. Company.

The J. D. Smith Foundry Supply Co. will have installed one of their latest models of core ovens.

The molding machine exhibits thus far arranged for, in the order in which they are located in the building, beginning at the southeast corner, include the J. W. Paxson Co., the Arcade Mfg. Co., the Killing Molding Machine Co., the Berkshire Mfg. Co., Henry E. Pridmore, E. H. Mumford, who will also exhibit the French molding machines made by Ph. Bonvillien and E. Ronceray, the Mitchell-Parks Mfg. Co., who, with their agents, A. Buch's Sons Co., and the Ontario Wind Engine Co., will show their gravity molding machines, the Tabor Mfg. Co., and the Herman Pneumatic Machine Company. All of these machines will be in operation. In addition, several machines will be shown in the Process Building, including the Reid molding machine shown by the Hamilton Facing Mill Co., and the Webb Molding Machine, shown by the Detroit Foundry Supply Company.

Core machines will also be exhibited by George H. Wadsworth, of the Falls Rivet & Machine Co., and the Diamond Clamp & Flask Company.

Procuring molding sand of suitable grade and then keeping the sand in condition are two difficulties which fall to the common lot of foundrymen. There will be two exhibits of machines designed to overcome these difficulties by mixing and tempering sand; one by the Standard Sand & Machine Co., and the other by E. H. Mumford Company. The latter will show one of the French Sand Mills, which has travelled from France especially to appear at this exhibit.

As has been the case in the past two years, the Chicago Pneumatic Tool Co. will install a compressor which will

furnish compressed air for those requiring it.

The running exhibits, however, will not be confined entirely to molding machines, but will include a number of interesting devices of different character for economy of labor in the foundry. The Osborn Mfg. Co. will have wire brushes in operation for cleaning castings made on the ground, while the Buffalo Forge Co. will supply the exhaust fan for removing the dust. The fan for the cupola will be driven by a steam turbine furnished by the B. F. Sturtevant Company. W. W. Sly will show his standard tumbling barrels and dust-arresting system. P. H. Baumgardner will have a core room in full operation, using Holland linseed oil.

In the Process Building will be installed several gas engines of recent design, and the increasing use of gas power will make this exhibit of particular interest.

Many of the firms showing in both buildings are preparing special features for the entertainment of visitors, and a description of these would make interesting reading, but as they wish the mutual pleasure of an agreeable surprise for their friends, they have requested us not to publish in advance their plans. We may say, however, that everyone coming will be interested and pleased.

Showing the Cupola Which is Being Installed by J. DeClercy to Supply Metal at All Times of the Day.

A large number of new devices will be shown for the first time in actual operation or by working models. It is now planned to have a general registration desk at the Association headquarters in the Process Building and also to have headquarters for each of the leading local foundrymen's associations in the same building.

At previous conventions it has frequently been difficult for members to get into communication with their friends who were present. It is hoped that establishing these local headquarters will help in overcoming this difficulty.

Admission to the buildings will be free to all members of the visiting associations, who will be admitted by badge and ticket furnished at the registration desk.

On account of the fact that many people not in the foundry business desire to visit the exhibit simply from general interest in the processes, provision has been made for charging a small admission fee at the door to non-members. We believe, however, that every foundryman will wish to join one of the five associations, unless he is already a member, as we certainly owe our support to the organizations which make possible the holding of such an exhibit. Also, it has been found necessary to limit the entertainment to members of the visiting associations, and this is something which no foundryman will willingly miss, as the entertainment features this year will be unusually fine. The local committees are now perfecting the details of their plans.

The secretaries of the different associations announce that a number of papers have already been prepared, insuring exceedingly interesting sessions.

The exhibitors, as well as the local committees, have been planning for the convenience and comfort of guests in every possible way. There will be ample resting facilities, many of the exhibitors will arrange to provide water coolers dispensing natural spring water from one of the noted springs in the vicinity.

The arrangement by which meetings will be held in the auditorium of the dairy building, which is located near the exhibit buildings, make it possible for the members to spend the entire day on the grounds, as there will be ample facilities for lunch furnished by a high-class catering company.

The Exhibitors.

The Osborn Manufacturing Co. expect to exhibit brushes and other foundry supplies. They will have some wire brushes in operation cleaning castings.

The Buffalo Forge Co. will have on exhibit an exhaust fan removing dust from the polishing wheels in the space of the Osborn Manufacturing Co.

W. W. Sly will have an exhibit of tumbling mills and similar equipment.

E. H. Mumford Co. will have their well-known Mumford molding machines, and also the French molding machine on exhibit. In addition to this, they will have a French sand mill specially imported for this exhibit.

Henry E. Pridmore will have an exhibit of molding machines.

The Standard Sand and Machine Co will exhibit sand-mixing, handling and tempering machines.

The Berkshire Manufacturing Co. will show their molding machines.

The Hawley Down Draft Furnace Co. will show the Schwartz molding furnaces.

The Tabor Manufacturing Co. will show molding machines.

The Holland Linseed Oil Co. will be making cores.

J. DeClercy, in the temporary building, will show one of the A. Baillot cupolas in operation.

The Herman Pneumatic Machine Co. will have in operation molding machines

The Monarch Engineering and Manufacturing Co. will show oil melting furnaces.

The Rockwell Engineering Co. will have oil melting furnaces.

The J. D. Smith Foundry Supply Co. will have a large core oven in operation.

Jones & Moore will have electric generators furnishing direct current for use in the building.

The Mitchell-Parks Manufacturing Co. together with their agents, A. Buch's & Sons, Elizabethtown, Pa., and The Ontario Wind Engine Co. will have an exhibit of molding machines.

J. W. Paxson will show molding machines and general foundry equipment.

Showing the Industrial Railway Which Was Improvised to Transfer Machinery From Cars Right Into Machinery Hall.

Jos. Dixon Crucible Co. will exhibit crucibles.

Calumet Engineering Co. will show cupolas and equipment.

The Arcade Manufacturing Co. will show molding machines.

E. Killings Molding Machine Works will show molding machines.

The Chicago Pneumatic Tool Co., together with their agents, N. J. Holden Co. will exhibit an air compressor and pneumatic tools of all kinds.

Kroeschell Bros. Co., Chicago will show their gyrating furnaces.

The Gregg Manufacturing Co., Cleveland, Ohio, will have an exhibit of their wire straightening machinery.

The Interstate Sand Co. will furnish the molding sand for the molding machines.

Baird & West, Detroit, will furnish Solvay Process coke for the cupola.

The Carborundum Co. will show grinding materials.

The Dominion Foundry Supply Co. have taken space in which will be shown their apparatus and that of The S. Obermayer Co., and The Whiting Foundry Equipment Co.

The Hamilton Facing Mill Co. have taken space in which there will be the exhibit of the H. Wadsworth core machine, Ballou's White Sand Co., and one or two other firms for which the Hamilton people are Canadian agents. This includes The Reid Molding Machine.

The convention headquarters and registration desk will be next to the main entrance.

Some of the other exhibits in the Process Building will be made by the following firms.

Castings, Cleveland: The Hill & Griffith Co., Francis, Hyde & Co., Montreal; The Foundry, Cleveland.

The Robeson Process Co.; Canadian Machinery, Toronto; R. B. Seidel; The Detroit Foundry Supply Co., who will show the Webb molding machine; W. W. Lindsay; The Cleveland Wire Spring Co.; The J./S. McCormick Co.; The Goldschmidt Thermit Co.; Canadian Gas Power & Launches, Limited, in whose space will be located gas engines for driving a Crocker-Wheeler generator for furnishing current to exhibitors; Frederic B. Stevens; Baird & West; Dominion Iron & Steel Co.; P. H. and F. M. Roots Co.; The Arthur Koppel Co.; The Auto Sand Mixer Co.; Stanley Doggett; The Western Foundry Supply Co.; The Farnham Sand Blast Co.; The Millett Core Oven Co.; Kroeschell Bros. Co.

The Detroit Testing Laboratory, who through their local branch, the Toronto Testing Laboratory, will look after the analysis of the pig iron for the cupola in operation.

The Detroit Foundrymen's Association, the New England Foundrymen's Association and the American Foundrymen's Association each have a booth for headquarters. The Philadelphia Foundrymen's Association and the Pittsburg Foundrymen's Association are having the same, as are also the Chicago Foundry Foremen Association.

Railway Rates and Hotel Accommodation

Reduced rates have been granted by the railroads in connection with the Toronto convention on the certificate plan of one and one-third fares for the round trip, with the following limitations and changes of interest to Canadian foundrymen:

Transcontinental Passenger Association advise the use of transcontinental tourist tickets.

Eastern Canadian Passenger Association grant exceptionally good rates, as follows: Forty-nine certificates or less passed in gives return fare at two-thirds regular rate. Fifty or more, return fare at one-third rate. Three hundred or more, return fare free.

Canadian Northern Railway grants same rates for points west of Port Arthur to Winnipeg. Get special information from ticket agents on line.

Lake Transportation Companies also will give special rates to parties on application.

In order to avail ourselves of these reduced rates, the following points should be observed:

Get to your station at least half an hour before train time, to give the agent a chance to make out your certificate.

When you purchase your ticket (full fare going) ask for a certificate on account of the Toronto convention of the American Foundrymen's Association, and take no receipt, as this will not be accepted by the joint agent of the railroads at the convention.

The dates of the convention having been placed at June 8 to 13, you can purchase your tickets and get certificates June 4 to 10. They will be vised at the convention June 10, 11 and 12, and you can purchase your return ticket at the reduced rate June 10 to 17 inclusive.

As the reduced rate is dependent upon 100 certificates passed in do not neglect to get them, as you not only profit by it, but your fellow-members as well.

Headquarters of the American Foundrymen's Association, American Brass Founders' Association and The Foundry Supply Association will be at the King Edward hotel. The Palmer House will probably be selected by the Associated Foundry Foremen. The following rates have been furnished:

King Edward Hotel, the finest in Canada, quotes for single room European plan, $1.50 per person per day up. Two persons per room preferred. This without bath. With bath $2.00 per person up. American plan, without bath, $3.50 per person per day up. With bath $4.00 per day up.

Queen's Hotel, American plan, $3.00 a day and upward a person; without bath. With bath, $4.00 a day and upward.

Rossin House, $2.50 a day up. Iroquois and the Palmer House $2.00 a day up per person. All American plan. These three hotels are situated on three corners of junction of King and York Streets.

Near the grounds there are two small hotels, the Parkdale and the Gladstone, which make a rate of $1.50 a day American plan.

Programme of Events.

The provisionel programme, subject to change, is as follows:

Monday Morning, June 8.—Exhibition will be ready.

Monday Evening.—Meeting of the Associated Foundry Foremen.

Tuesday Afternoon, June 9.—Formal opening of the convention and exhibition. Joint meeting of the American Foundrymen's Association, American Brass Founder's Association, Associated Foundry Foremen, and Foundry Supply Association.

Tuesday Evening.—Official reception at the City Hall.

Wednesday Morning, June 10.—Exhibition closed during the session. Business session of the association. Brass Association will hold meetings in separate building.

Wednesday Afternoon.—Business session.

Wednesday Evening.—Left open.

Thursday Morning, June 11.—Exhibition closed during this session. Business session.

Thursday Afternoon.—Business session.

Thursday Evening.—Moonlight excursion on the lake.

Friday Afternoon, June 12.—Trolley ride.

Friday Evening.—Smoker.

A ladies' reception committee will see that the visiting ladies are well cared for and entertained. Automobile rides, shopping expeditions and theatre parties are on the programme for their especial delectation.

NEW AUTOMATIC MOLDING MACHINE.

The Arcade Mfg. Co., Freeport, Ill., will exhibit at the Foundrymen's Convention at Toronto, an automatic molding machine.

The general construction of the machine is shown in Fig. 1. As will be seen in the illustration, the sand is carried from the floor by means of a conveyer into a rotary riddle. From this point it is carried by belt conveyer into a hopper of large capacity.

When the machine is to be operated the flasks are placed as in Fig. 1. By moving a lever, a device for striking off sand is run into position over the flasks as in Fig. 3. By means of another lever the sand is dropped from the hopper into the flasks with sufficient force to tuck it thoroughly around the patterns. In order to make this operation thorough, the vibrators (two of them) are put into operation so that the sand is tucked perfectly into place. The strike-off then automatically returns to its former position; the bottom and cope boards are put into place and automatic clamps hold them firmly in position. The table is rolled over and the ramming operation begins. When the proper pressure has been exerted the clamps that hold the cope and bottom boards automatically release and the double vibrator is

put into operation while the patterns are drawn from the sand, as in Fig. 2.

While the first set of patterns are being pressed, the operator is placing another set of flasks in position on to another set of plates on the upper side of the table, so that while the first patterns are being drawn, the sand is being tucked around the second set of patterns. By the time the table has resumed its first position, the first mold is automatically run forward on the carriage as in Fig. 3. Here it is closed by a helper and carried away.

All this is accomplished in much less time than it requires to tell it; and the operation is simple and rapid. The operator of the machine merely stands in his place and works the levers shown in Fig. 4, and places the flasks and boards in position and the machine does the rest.

Among the many new features embodied in this machine, is the working of two separate sets of pattern plates, not necessarily of the same article, on one machine. In the illustration, the patterns used are those of a lamp bracket. On one side of the table the pattern plates are for the arm of the bracket, on the other side, the wall plate of the bracket. The molds which this machine makes are claimed to be perfect in every particular, and the machine is very simple in construction when the work accomplished is considered.

This machine will be in full operation at the Toronto convention and will be of very considerable interest to the representatives of firms who manufacture certain articles in very large quantities. A great many of the special features of the machine are covered by separate patents.

Fig. 1.

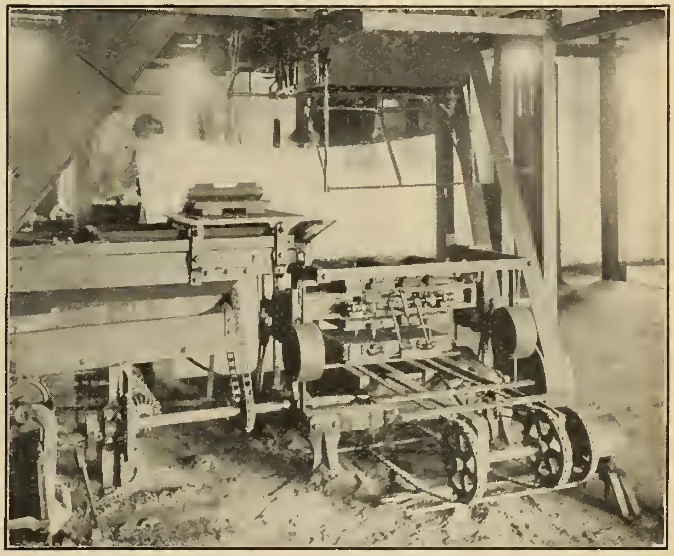


Fig. 2.

Fig. 3.

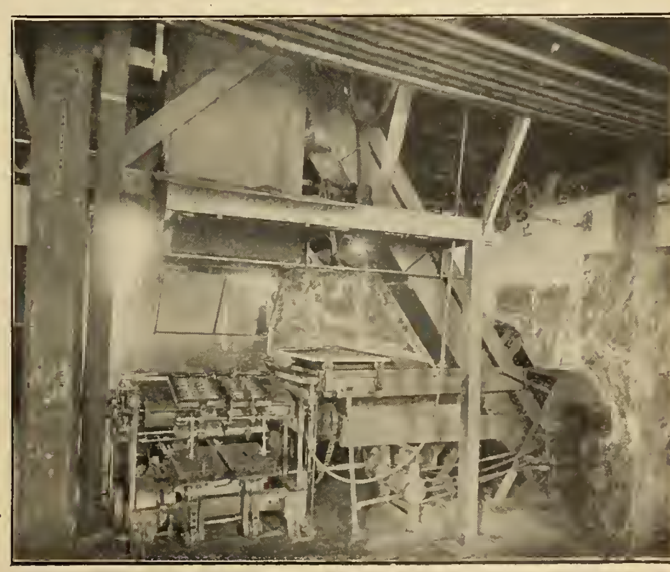


Fig. 4.

METALLURGY AT McGILL.

A new scholarship has been arranged for in Montreal, in metallurgical engineering with the object of ascertaining the effect of the structure of metals on their mechanical properties and wearing quality, particularly in the case of steel rails, axles, tires and chilled iron wheels. The holder will be enabled to visit steel works and rolling mills. The necessary funds have been furnished by Dr. Milton L. Hersey for the first year and the work will be carried on under the direction of Dr. A. Stansfield, professor in metallurgy.

Repetition Pattern Work: Working and Master Patterns*

Gates, Runners, Risers and Supporting Connections; Materials for Patterns; Summary of Rules for Pattern Making.

By E. H. BERRY

Arrangement of Gates, Runners, Etc.

If any portions of the desired casting are very heavy, in comparison with the remaining portions, the gates should be arranged to feed into the heavy parts. The gates should usually be wide and thin so as to break off easily. If the casting is very light it may be necessary in addition to nick the gate. Care should be taken to leave a good fillet between the nick and the casting itself as shown

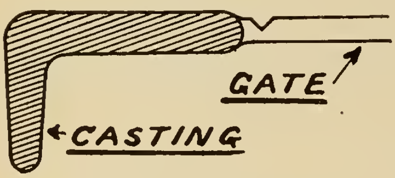


Fig. 26—Nicked Gate.

in Fig. 26 in order to give a clean break at the nick.

To secure uniformity among the castings from any one card, it is desirable to card them all alike, as shown in the upper part of Fig. 27, and not half right and left, or half at one end and half at the other, as shown in the lower part of the same figure. Shifting the gate or turning the pattern over may cause variations in the casting, due to the different feeding and cooling conditions. It may also give trouble during machining as the irregularities due to gating come at one point in some of the castings, and at another point in others.

To avoid "washing" it is usually desirable to locate the gate in such a way that it will not be in the direct line of flow through the runner. To effect this, the gates may either branch off of the sides of the runner, as in Fig. 27, or if this can not be done, an offset may be provided to check the rush of the metal as in Fig. 28.

Unless the pouring conditions are such as to require feeding the metal up into the mold from the bottom, the runner should be kept as high as possible, so as to get the best metal into the casting proper. This will usually involve putting the runner into the cope. An excellent cross section for the runner is shown in Fig. 29.

The draft on the sides is sufficient to give an easy draw, even though it is in the cope, and the section is heavy enough at all points to prevent danger of chilling. The section, flat on one side and curved on the other, which is sometimes used should be avoided as it is too thin at the edges. A rather neat expedient which sometimes proves helpful is the use of a diamond shaped runner as shown in Fig. 30. If the usual shape of runner had been used, as shown in Fig. 31, the incline at A would have been entirely too steep, and there would have been a very objectionable hanging pocket of sand at B.

Risers or shrink balls are required only in special cases to avoid piping or excessive shrinkage in heavy parts of the casting. As a discussion of the points at which they are necessary would lead into an entirely unrelated subject, they are merely mentioned here in passing as details which must be provided for when circumstances require them.

If the pattern is mounted on a vibrator frame, the latter should always rest on top of the mold board as shown in Fig. 33, and never be let down into it. As the surface of the mold board corresponds to the parting surface, the opening in the vibrator frame must be given draft away from the mold board as shown in Fig. 33.

The connection between the pattern and the frame should in almost every case lie on top of the mold board, and should be connected to the frame somewhat as shown in Fig. 34.

In snap flask work, it may be necessary to resort to a band in certain cases. This has been treated in detail elsewhere

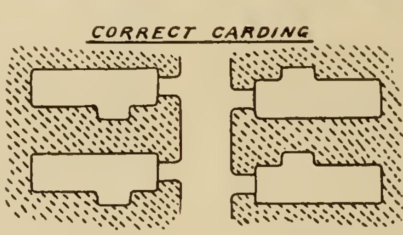


Fig. 27—Correct Carding.

in this article. If a band is placed in the cope it will clear the connection shown in Fig. 34, but if a band is needed in the drag, this form of connection would necessitate a notch in the band at the very point where the plugging of the hole left by the connection leaves the mold the weakest. To avoid this, the connection may be set into the mold board. This will permit the band to come down to the mold board, that is, extend up to the top of the drag, as shown in Fig. 35.

Material of the Pattern, Runner, Etc.

For patterns which are used sufficiently to prevent them from rusting, cast

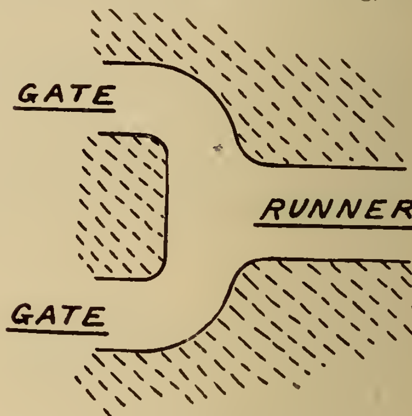


Fig. 28—Offset Gates.

iron is by far the best material. It is not only cheap, but it meets the requirements of durability and lightness, and its surface, when free from rust and well waxed, gives a clean draw from the sand. If an iron pattern is out of use for any length of time, it is almost impossible to prevent rust spots, and these spoil the surface very quickly. Of course, the length of time in which an iron pattern may remain idle without rusting depends a good deal on the conditions under which it is stored, and the care taken in cleaning and waxing the pattern before it is put away.

If a mold board is used, it is usually desirable to keep the pattern and mold board together. When a wooden mold board is used, a very dry atmosphere shrinks and cracks, while even a moderate amount of humidity increases the liability of the pattern to rust. To avoid changes in the mold board the atmospheric conditions in the pattern storage must be made to correspond, as closely as possible, to those in the foundry. This may compel us, in the case of patterns used only at infrequent intervals, to resort to brass, bronze or other alloys, but all of these are heavier than cast iron and the sand has a greater tendency to stick to them. In the case of large patterns they may also be more costly, but in small patterns the possibility of using commercial

*Continuation of article appearing in January and March issues of Canadian Machinery. Read before A. S. M. E.

shapes, which require little or no machining, may permit of savings which will more than offset the extra cost of the material.

Owing to the ease with which they can be soldered or brazed, the above mentioned alloys may sometimes be desirable for a costly pattern in which extensive changes are likely to be made.

Steel is no better than cast iron in the matter of rusting, and possesses little advantage over brass in weight or cheapness. It is not much used for patterns.

Aluminum is not very well suited for the pattern itself, as it is hardly dur-

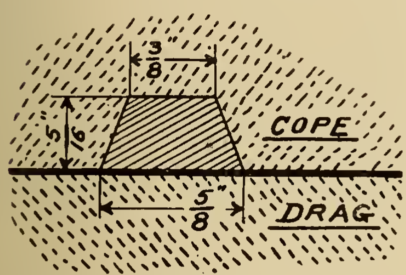


Fig. 29—Cross Section of Runner.

able enough, and sand has a tendency to stick to it. It is, however, the best material for plates, and for vibrator frames. If made from any other material their weight would be almost prohibitive.

Wooden patterns are entirely unsuited for any but the roughest kind of repetition work. Even if the accuracy required is not very great, it will usually pay better to make metal patterns if a great number of castings is required.

For waxing metal patterns a liquid composed of bayberry wax cut with benzine until it is thin enough to apply with a brush, will be found very satisfactory. By painting with this liquid,

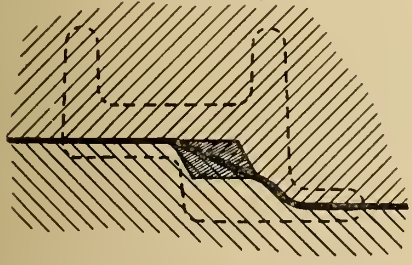


Fig. 30—Good Parting Obtained by Diamond Shaped Runner.

a pattern can be waxed more quickly and evenly than by the usual process of heating and rubbing with beeswax. The bayberry wax also gives a superior surface as it dries on in a thin hard coat, free from the stickiness which frequently gives trouble if ordinary beeswax is used. Bayberry wax is used to some extent in pharmacy, and can be obtained from any drug store.

The Points on the Pattern at Which Special Accuracy is Required.

The importance of accuracy at different points on the pattern is indicated by the order followed in the list below:

A. Close clearance points at unmachined portions of the casting.

B. Locating points for the various machining operations.

C. Unmachined surfaces which should bear a fixed relation to each other or to machined portions of the casting.

D. All remaining unmachined portions of the casting.

E. Machined portions of the casting.

The machined portions are placed last in the list because a slight variation in the amount of finish can be tolerated. The accuracy of the pattern at the points where no finish is allowed is far more important, because the final dimensions of the casting depend entirely on the pattern. The locating points are also important, for if the castings from different patterns do not correspond at these points, variable results will be obtained from the machining operations.

Surfaces which are not machined, or which are used as locating points, should always be placed with reference to each other in such a way as to minimize the danger of incorrect spacing due to the possible cumulation of errors in measuring back and forth on the pattern.

Take, for example, a piece of the shape shown in Fig. 36. The surfaces marked f are to be machined, and the legs are to have a width C after machining. No special accuracy is needed for the distances E and F, as any slight variation will be corrected by the machining. On the other hand, if there are slight variations in G and H the errors might add up, and they might possibly be still further increased by slight errors in J, until the final width between the unfinished surfaces might become greater or less than the desired value D. But as the outside surfaces are machined to the fixed distance A + 2B, the thickness C can not possibly come right unless D is right, and a small percentage of error in D would cause a considerable error in the width C. Many a case in which the wall of metal left after machining is entirely too weak, or in which the cutters fail to clean up a boss, or in which they dig in after milling the boss away entirely is due to disregard of these facts.

In entering each dimension care should be taken to make the number of decimal places correspond to the degree of accuracy required, in accordance with the method described in the first part of this paper.

The first item to be considered is the outlay on drawings, and there are really only two courses open to us. We can choose between making the drawings and not making them. We can avoid all unnecessary "frills" on them, but if they are made at all, they should be complete and reliable. They should be omitted only in very unimportant patterns, or in the case of patterns which fall into the very lowest grades of the repetition class.

In the actual construction of the patterns there is more opportunity for grading the work to suit the requirements, and for devising means of pro-

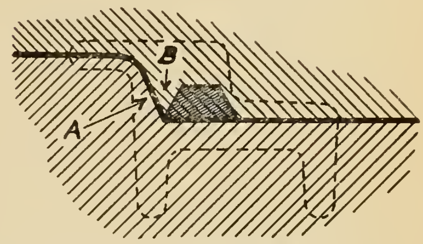


Fig. 31—Undesirable Parting Due to Shape of Runner.

ducing the pattern quickly and cheaply. In planning the method of executing the work, we should consider, first the degree of accuracy required, and second the expenditure which will give the most economical relation between investment and earning capacity. Careful attention to the varying degrees of accuracy, indicated on the drawings in the manner already referred to, will enable all unnecessary refinements to be avoided, and with a little ingenuity, labor saving short cuts can almost always be devised.

The form of the pattern should be studied to determine whether to build it up, cut it out of the solid, make it from a casting which is machined all over or

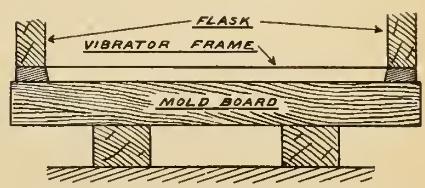


Fig. 33—Direction of Draft in Vibrator Frame.

from a casting machined only at certain points.

In the case of built up patterns it is often possible to use commercial brass rods which require no finish, or to use bars of any desired cross section which can be milled to shape accurately and cheaply by means of fly cutters, and then cut up as needed.

Many small patterns can be made from a solid bar of brass or cast iron more cheaply than from individual cast-

ings. If a pattern is of such a shape that it can best be produced from a casting, it may pay to make an accurately finished metal master pattern, castings from which can be finished up with the minimum amount of machining. Frequently the machining can be omitted altogether, the only finish required being a smoothing up with files and emery cloth. Or certain spots may be machined and the balance smoothed up. Of course, in making castings for this purpose care must be taken to avoid excessive rapping and to use a fine sand which will give the smoothest possible

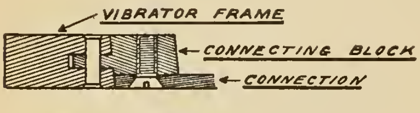


Fig. 34—Supporting Connection From Pattern to Vibrator Frame.

surface. To avoid errors due to hand molding it may also pay to mount the metal master pattern for temporary use on a molding machine.

The relation between working patterns, master patterns and grand master patterns can perhaps be brought out most clearly by quoting the following rules which the author drew up some years ago, and which have been followed since that time with good results:

Rules for Pattern-making.

All patterns will be classed under one of the three following heads: (a) Working patterns. (b) Master patterns. (c) Grand master patterns.

Working patterns used for repetition work shall be of metal, and in most cases mounted for use on the molding machines.

Working patterns used for experimental work, or for jobbing work shall be, in most cases of wood. When practicable, they shall be arranged for temporary mounting for use on the molding machines.

Master patterns may be of wood or metal, according to circumstances. When the piece to be produced permits, the working patterns shall be made by smoothing up castings taken from a metal master pattern. In cases in which it is preferable to machine the working patterns, the master pattern usually shall be of wood.

Grand master patterns shall be of wood, or if made of metal shall be built up out of stock material. They shall be used in cases where it is necessary to obtain a casting out of which to make a metal master pattern.

Excepting in special cases, for which special provisions are made, the following general instructions shall be observed in making patterns and in making drawings for them.

Metal Working Patterns.

Metal working patterns are the standard patterns for repetition work.

They are made from drawings showing the finished dimensions of the pattern itself. These drawings will be dimensioned to cover all necessary allowances for finish, shrinkage, and draft, and there will be no further allowance ard patterns for repetition work.

They are made by smoothing up castings obtained from the metal master pattern, or by machining castings obtained from the wooden master pattern, or by building up out of stock material.

They are mounted for use on the molding machines in accordance with the carding drawing.

They are stamped on the runner with the part number of the first piece produced from this casting. If one casting is machined to make several different pieces, the pattern will still have only one pattern number, which will be identical with the part number of the first piece produced. Each card will have a distinguishing mark, usually one dot on the first card, two on the second, etc., which will be placed so as to be visible in the casting even after it is machined. This mark will be in each pattern of the card, and alike in all patterns of any one card. Even if there is only one card, the distinguishing mark is to be put on it, as another card might be made later.

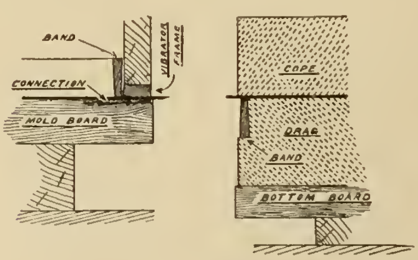
Wooden Working Patterns.

Wooden working patterns are the standard patterns for experimental or jobbing work.

They are made from drawings showing the finished dimensions of the piece. The pattern must, therefore, be made with allowance for single shrinkage, draft and finish, as noted on the drawing.

They are mounted for use on the molding machines whenever practicable.

They are stamped with the pattern number, which corresponds to the number of the finished piece. If one casting is machined to make several dif-



Band Testing on Mold Board. Band in Position in the Completed Mold.

Fig. 35—Method for Providing for a Band in the Drag.

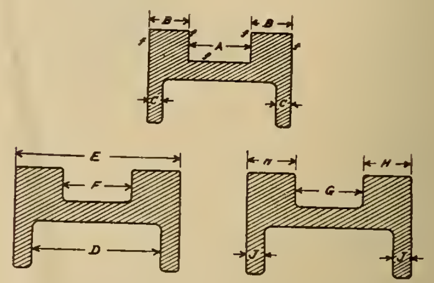
ferent pieces, the pattern will still have only one pattern number corresponding to the number of the first piece produced from it.

Particular attention is directed to the fact that patterns for runners fall under this heading and must comply with these requirements.

Metal Master Patterns.

Metal master patterns are used to obtain castings suitable for use as working patterns after they have been smoothed up or used in cases in which a wooden master pattern would not be durable enough.

They are made from drawings showing the finished dimensions of the metal master pattern itself. These drawings will be dimensioned to cover all neces-



Correct Method of Dimen- to ing Pattern. Incorrect Method of Dimentioning Pattern.

Fig. 36.—Arrangement of Pattern Dimensions.

sary allowances for finish, shrinkage and draft, and there is to be no further allowances made when making the pattern.

They are made of castings obtained from the grand master pattern, or by building up out of stock material.

They are mounted temporarily for use on the molding machines to facilitate the obtaining of good castings.

They are stamped with the pattern number.

Wooden Master Patterns.

Wooden master patterns are used in cases in which the metal working pattern has to be machined.

They are made from drawings showing the finished dimensions of the metal working pattern. Allowance for single shrinkage, and an additional allowance for finish all over must be provided when making the pattern.

They are mounted temporarily for use on the molding machines when practicable.

They are stamped with the pattern number.

Grand Master Patterns.

Grand master patterns are needed only in cases in which a metal master pattern has to be made out of a casting.

They are made from drawings showing the finished dimensions of the metal master pattern. Allowance for single shrinkage and an additional allowance for finish, as marked on the drawing, must be provided when making the pattern.

They are mounted temporarily for use on the molding machines when practicable.

They are stamped with the pattern number.

The distinguishing mark on each pattern which is referred to in the rules

above quoted is provided for the purpose of identifying the card from which a given casting was produced. This is a necessary feature if duplicate sets of patterns are run.

In discussing the flask sizes, reference has already been made to the use of a few patterns in a small flask for such patterns as would not warrant a larger pattern equipment. And even if a smaller flask is not practicable or desirable, it may often pay to make and card only a few patterns, leaving the balance of the mold unused, in preference to spending money in the tool room which the saving in the foundry might not offset in years.

When undertaking new work it is always a wise precaution to make and card only a part of the patterns, leaving the balance to be added later so as to facilitate the making of any changes or improvements which may suggest themselves in turning out the first few lots.

In the same way, if it is desirable to put through a limited number of castings from a new pattern to test out the tool equipment, much valuable time can often be saved by getting the castings as soon as a single pattern can be made and carded. The remaining patterns of the card can be added later.

If a portion of the mold is unused, do not spread out the patterns. Card the ones which are nearest to the sprue, and keep them close together to avoid waste of metal in the runner.

It is usually false economy to mount two or more different patterns on one card. Even if it seems that the proportion in which they will be used can be definitely fixed, for instance in the case of rights and lefts, unforeseen circumstances may arise at any time to upset the calculation. Repair orders may be heavier for one casting than for the other, or a batch of work from one casting may be spoiled and have to be scrapped, or the loss in the foundry or in the factory may be heavier for one than for the other. These and similar conditions may make it necessary to increase the output on one of the castings, and this is always troublesome and wasteful if different patterns are mounted on a single card.

One detail which it is necessary to watch is the tendency to "save time" by being careless in regard to the radii of fillets and rounds. A fillet is often difficult to produce, but that is no reason for shirking the work on it. Pattern makers should be provided with radius and fillet gages, and should be made to work to them.

The guide pins on each "plate," frame, etc., should be carefully fitted to a gauge so as to ensure squareness and accurate spacing. A single adjustable gauge with a series of doweled settings may be used to cover the entire range of flask sizes.

If careless work is permitted in the fitting of these pins, the foundry is driven to a more or less ineffectual tinkering of the flaskpins every time a pattern is changed. If proper precautions are taken to maintain the standard, all patterns and flasks of the same size will be perfectly interchangeable. A little graphite (not oil) should be used to lubricate the pins, and the fit should be as tight as is consistent with a smooth lift.

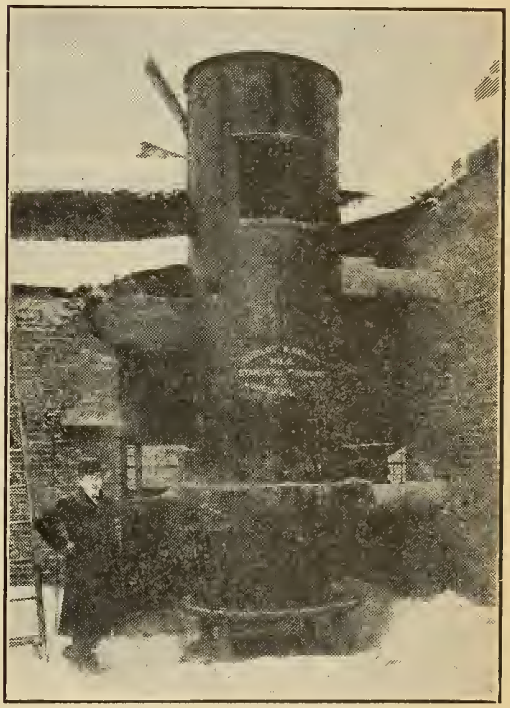
BAILLOT CUPOLAS.

In the blast furnace the proportion of heat that would be utilized was very small some years ago; better returns are obtained to-day by utilizing the waste gases for heating the blast, getting power by means of gas engines, etc. Many inventors have vainly tried to secure the same advantage in the foundry cupolas. The difficulty of the problem consists in the small duration of the operations which prevents adding costly apparatus.

A Belgian engineer, Mr. A. Baillot, has obtained, however, improvements in the practice of cupolas by means of recuperating a part of the waste gases. Already many leading founderies of France, Belgium, Russia, Italy, Spain, as, for instance, the large works of Le Creusot, La Providence, etc., have adopted the Baillot process. Baillot cupolas were installed two months ago by Mr. J. de Clercy, 62 Ontario St. Montreal, general agent of the Baillot Co., in the foundry of Mr. Pheaume, Montreal, and the works of the Standard Foundry & Machine Co., Longueil, P.Q., and they have given good satisfaction. The economy of fuel has been thirty per cent. in the first case, with coke, and twenty-eight per cent. in the second one with coke and coal. The rapidity of melting has been increased as well as the total capacity of the cupolas, the cast iron is at proper heat, and of good quality.

These advantages are obtained by several special features. Part of the gases are used again with their sensible and latent heat, mixed with the cold air and blown through the wind belt and the tuyeres. The advantages are treble: First, the sensible heat of these gases raises the temperature of the air and so decreases the freezing down of the drops of iron in front of the tuyeres; second, the carbon monoxide being a combustible gas, adds its heating power to that of the solid fuel; third, the carbon dioxide thus mixed with the air is not without effect. Its utility is raising the temperature in the upper parts of the bed at the expense of the temperature in the lower parts. When this gas passes through a very hot zone of carboneous fuel, it is dissociated at the expense of the excess of heat in this zone to form carbon monoxide, a combustible gas, which burns in the upper part of the bed of fuel, i.e., at the very contact of the iron with the coal. This new combustion to be complete requires a new influx of oxygen in the shape of air, in this same zone. New tuyers are located at this very spot, a few inches below the upper part of the fuel. Their location is most important. It depends on the nature and density of the fuel.

The recuperation of gases is made in the Baillot process by means of a hollow cast iron ring having a large cooling surface set in the brick lining, under the charging door. Air is sucked down by the blower through the wings of this ring which is thus cooled down and gases are mixed with the air through several openings. The Baillot Co. is so confident in the economy to be realized in foundry practice that they generally offer to install their cupolas and receive in payment the economy for a limited number of heats.



The Baillot Cupola.

Another good point in this cupola is that, during operations of melting, no flames are to be seen on the top of the stack and a spark filter may be set up on the chimney without being promptly burnt out by the heat. By these means a Baillot cupola may be erected in the inhabited parts of any town without complaints from neighbors or prevention from local authorities.

A Baillot cupola is to be erected and put in operation at the American Foundrymen's Convention in Toronto in June to furnish iron to the molding machines. The operation of a cupola will be a new feature, and a good one.

CANADIAN MACHINERY
and Manufacturing News

A monthly newspaper devoted to machinery and manufacturing interests mechanical and electrical trades, the foundry, technical progress, construction and improvement, and to all users of power developed from steam, gas, electricity, compressed air and water in Canada.

The MacLean Publishing Co., Limited

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Cable Address:
Macpubco, Toronto. Atabek, London, Eng.

SUBSCRIPTION RATE.

Canada, United States, $1.00, Great Britain, Australia and other colonies 4s. 6d., per year; other countries, $1.50. Advertising rates on request.

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Vol. IV. JUNE, 1908 No 6.

CONTENTS

IS THE REPORT SO VALUABLE?

The report of the Hydro-Electric Power Commission on producer gas, steam, etc., is said to be a valuable addition to the power literature of the Province of Ontario. But is it? On the top of the table of tabulated data on gas plants appears this statement:

> The data given is believed to correctly represent present day results, and has been based on information supplied by the firms using the plants. No attempt has been made to check this information."

This is an acknowledged weakness at the very start. No tests were made. Manufacturers estimated what power they were using. The Commission based its fuel consumption on these estimates. How many power users could estimate their power consumption within 25 or even 50 per cent.? Results based on data which may be 25 or 50 per cent. out can scarcely be claimed even approximate.

One steam engine builder says the figures for steam engine practice are twice what they should be, calculations being based on good up-to-date equipment. Another says that almost any average figures might be struck and be reasonable, depending on plants considered. The figures of the Hydro-Electric Power Commission are average figures. Still another builder says that the figures of the Hydro-Electric Power Commission cannot be taken by power users as definite information as to what steam power would cost them.

All three builders have a wide reputation and their statements can be substantiated.

Therefore we ask: is this report of the Hydro-Electric Power Commission of particular value?

NOT A FAIR BASIS OF COMPARISON.

Figures given by the Hydro-Electric Power Commission on gas and steam are intended for comparison with the Commission's promised figures on electric power from Niagara. Calculations for hydro-electric power are based on the best practice obtainable, whereas figures on gas and steam are based on average practice obtaining in different parts of the country. Is that an endeavor to hoodwink the power users?

To place both sets of figures on the same basis estimates should have been obtained from reliable builders on best and most economical practice as to the cost of steam and gas power.

DEPENDING ON CIRCUMSTANCES.

On page 14 of the Hydro-Electric Power Commission's report on gas and steam power appears the following statement:

> "Therefore in comparing the cost of power at the engine shaft, as given in the estimates, with electric power, bought as such, an addition to the cost per B.H.P. must be made to obtain the equivalent value of an E.H.P. This addition will usually be about 15 per cent., as for this amount the power user could install the necessary electrical machinery and turn out his power in the form of electricity."

Considerable uncertainty and misunderstanding is prevalent concerning this statement. As it stands, there is reason for this. The statement should be modified.

Whether 15 per cent. should be added to the cost of brake horse power at the engine to compare it with cost of electrical horse power depends upon how the power is to be used. By far the greatest number of small manufacturers apply their power direct to the main shaft. In that case this statement should practically be reversed. An addition would have to be made to the cost of electrical power in order to compare it with brake horse power at the engine. The Commission's statement only holds good where the power is required in the form of electricity for motors and lighting, that is, where the brake horse power of the engine must be transformed into electrical power before it can be used.

ENGINE BUSINESS CURTAILED.

Several municipalities have already signed contracts with the Hydro-Electric Power Commission. Many other municipalities are considering and discussing it. Meanwhile what manufacturer or power user has any definite idea as to what power from Niagara will cost him? Many a power user needs to do something in the way of getting power, but he doesn't know what to do. He won't buy a steam engine; he won't buy a gas engine. Why? Because he is told he can get hydro-electric cheaper. The result—during a slack period things are made slacker because of the veil of uncertainty which hangs over the whole Niagara power question. The sale of power machinery has been hit on the head. According to the Hydro-Electric Power Commission, Niagara power was to be a boon to the Ontario manufacturer. Instead it is proving a bane. Manufacturers of power machinery and supplies are having sales curtailed right and left as a direct result. This affects not only these manufacturers, but indirectly all manufacturers, and, in fact, all trades and industries.

AS TO WHAT WILL BE.

Let us venture a prophesy. When the mist clears away hydro-electric power will not be all in all. We will still have the steam engine. We will still have the gas engine. Manufacturers will find when they come to foot the bills that hydro-electric power will cost them more than is said. They will find that the good steam engine has a place which is not easily usurped. They will also find that the gas engine and producer gas plant, when properly built and properly installed, are reliable and economical agents of power, and that there is a field for them.

When the steam turbine first came out it was going to entirely displace the reciprocating engine. Even some manufacturers of reciprocating engines themselves were frightened. One engine builder in Canada got out plans for a turbine at the time, with the idea that their reciprocating engine business would go to the dogs. That firm still have those plans, and could supply a turbine if required; but their reciprocating engine business has made great strides since then.

THE CORNER TURNED IN U. S.

Asked by "Machinery," New York, as to present business conditions and outlook in the United States, 723 machinery builders replied, and the consensus of opinion, based on actual conditions, is that business is improving —that the corner has been turned. This should be a source of encouragement to Canadian machinery manufacturers. If an improvement can be noticed in the United States, where the depression was so much more severe than in Canada, the improvement which is to be noted in Canada should proceed quite vigorously.

BRIGHT PROSPECTS IN WEST.

The International Harvester Co. have just shipped 200 carloads of harvester machinery out West, making 300 in all this spring. The Western agents of this company give very encouraging reports on trade conditions out there. The Massey-Harris Co. have opened a warehouse in the West this spring, and they say that if crops materialize as indications at present promise, the West will be in fine condition in the fall. There is a general feeling of optimism in the West now, which was lacking before crop prospects appeared so good.

The foregoing facts afford food for meditation, which meditation should result in a feeling of genuine optimism in the machine tool and general machinery business. Optimism based on facts is catching, and optimism is the health of trade.

EMERGENCY HOSPITAL IN SHOPS.

There is a feature of several manufacturing establishments in Canada and the United States which might be developed in a good many other manufacturing plants. This is the emergency room, provided with all the necessary equipment in caring for an injured workman until he can be removed to the hospital in a serious case, and also in the case of minor injuries, to care for them in an efficient manner.

In the Montreal Rolling Mills there has been inaugurated a system of first aid to the injured which has worked very efficiently. The management of the first aid system rests in the hands of a committee of five of the superintendents, who pick out men in the different departments to take charge of any accident case there may be. These men were given a series of lectures on first aid to the wounded at the company's expense. A supply of bandages and all necessary equipment for this first aid is kept in convenient places by the company. This system has been well tested and has done good work in several instances.

The Taft-Pierce Co., Woonsocket, R.I., manufacturers of small machinery, such as typewriters, sewing machines, etc., have a miniature hospital in their machine shop, equipped with an elaborate set of instruments and accessories necessary in caring for slight or serious accidents. They have had, as well, a series of lectures on first aid to the wounded. This equipment includes a stretcher, a stand for doctor's instruments and bottles, wash basin and stand, a cupboard of drugs, bandages, etc., and a cabinet of surgeon's tools. In this place a serious case could be attended to at once.

Especially in a manufacturing plant where accidents are, even with the greatest precautions, liable to happen at any time, should such a system be inaugurated. Very few large manufacturing plants of any size are built now, in which there isn't more or less efficient conveniences for the employes, and in some plants an emergency system of aid to the injured is quite as important as good ventilating, good heating and a good lavatory system, since although it may not be constantly used, when it is needed, it is needed badly, since a human life may hang in the balance.

PERSONAL MENTION.

Mr. E. G. Yeates, of the London Machine Tool Co., Hamilton, is on an extensive business trip to Western Canada.

* * *

Mr. A. E. Peters, President of the Record Foundry Machinery Co., Moncton, N.B., spent a week at their Montreal factory last month.

* * *

Mr. J. W. Hayes, commissioner of docks at Bristol, England, paid a visit to the Montreal harbor, Angus shops and other industrial centres.

* * *

Mr. Henry D. Bayne, manager of the Canadian Westinghouse Co., Montreal, who has spent the last two months in Europe, is back in Montreal.

* * *

George C. Rough, sales manager of the Packard Electric Co., is now making his headquarters at the Montreal office of the company, Bell Telephone Building.

* *

The British Colonial Office has offered the appointment of director of works at Jamaica to Herbert C. Burchell, C.E., manager of the North Sydney Cement Company.

* * *

The honorary degree of LL.D. has been conferred upon Milton Hersey, M.Sc., of the Milton Hersey Co., Ltd., Montreal, by the Senate of Queen's University, Kingston.

* * *

Gordon Sproule, B.Sc., son of W. J. Sproule, engineer of the Harbor Commission, is winner of the scholarship in metallurgy at McGill, Montreal, given this year by Dr. Hersey.

* * *

Mr. J. Dix Fraser, late works manager of the Dominion Iron & Steel Company, Sydney, N.S., has accepted the position of general manager of the Atikokan Iron Company, Port Arthur, Ont.

* * *

T. W. Meachem, President of the New Process Raw Hide Company, has been elected President of the Chamber of Commerce of Syracuse, N.Y., in which city the New Process Raw Hide Company is located.

* * *

Mr. E. G. Acheson, of Acheson Graphite Co., Niagara Falls, has been awarded the Rumford medals by the American Academy of Arts and Sciences in recognition of his discoveries of industrial products of the electric furnace. These products are carborundum, siloxicon, artificial graphite and deflocculated graphite.

* * *

Mr. P. W. Southman, chief engineer of the Ontario Hydro-Electric Power Commission, has returned from a trip to Grand Rapids, Croton and Muskegon, Mich., where he has been investigating the high power transmission lines. He inspected at Grand Rapids a power station and transmission line which carries 76,000 volts. Nothing definite has yet been decided about the equipment of the Ontario Hydro-Electric Power Commission's proposed transmission line, other than that some form of suspended insulator will be used. Mr. Southman will also visit the Central Colorado Power Company's plant at Colorado Springs. This company is installing a 90,000 volt transmission line, which will be started in about a fortnight. Later Mr. Southman intends to visit the Stanislaus Electric Company's plant and that of the Great Western Company in California, as well as some large plants in Mexico. During the summer also he will visit Europe to study the transmission lines in use there.

NEWS OF THE SOCIETIES.

Canadian Railway Club.

The annual meeting of the Canadian Railway Club, Montreal, was held in the Windsor Hotel, May 5th. The total membership is now 682, and the treasurer's and secretary's reports showed the club in a very flourishing condition. The following officers were elected: President, L. R. Johnson, assistant superintendent of motive power of the C. P.R.; Vice-President, H. H. Vaughan, assistant to the vice-president of the C.P.R.; Second Vice-President, A. A. Mayer; Executive Committee, J. H. Callahan, Jas. Coleman, A. A. Goodchild, T. McHattie, A. W. Wheatley and W. N. Dietrich; Audit Committee, W. H. Evans, W. H. Stewart and C. Manning; Secretary, James Powell; Treasurer, S. S. Underwood.

During the evening the past presidents were presented with valuable souvenirs in appreciation of their services, the following being recipients: E. A. Williams, president 1902-1903; T. McHattie, president 1904; S. King, president 1905-1906; W. E. Fowler, president 1906-1907, and W. D. Robb, president 1907-1908.

Electrical Convention Postponed.

The following announcement has been sent out by T. S. Young, secretary of the Canadian Electrical Association.

Owing to the fact that the American Foundrymen's Association, a large international organization, will hold a convention in Toronto from June 8th to 12th, and have reserved practically all the rooms in the leading hotels, it has been decided to postpone the convention of the Canadian Electrical Association for one week, when ample hotel accommodation will be available. Kindly note the convention will be held on Wednesday, Thursday and Friday, June 17th, 18th and 19th, instead of the dates originally announced, and advise your friends of the change.

Canadian Engineers Meet in August.

It is expected that the convention of the Canadian Association of Stationary Engineers, to be held in Windsor on August 12th, 13th and 14th, will be the best in the history of the association. The place of meeting is an attraction in itself; and the fact that the Canadian Engineers' exhibitors will make an extensive exhibit of engineers' supplies, is a great drawing card.

Paper on Malleable Iron.

On May 14th at the Engineers' Club, Toronto, a very instructive illustrated address was given by S. D. Chadsey, of the Canadian Laboratories, Toronto, on the manufacture of malleable iron. Mr. Chadsey spoke from actual experience in the plant of the International Harvester Co.

Industrial Education.

At the regular monthly meeting of the Central Railway and Engineering Club, held in the Rossin Housee, Toronto, on May 19th, a paper on "Training for Industrial Life" was presented by Mr. Clarkson James, secretary to the Department of Education.

Meeting of Mechanical Engineers.

As reported in last month's issue, the semi-annual convention of the American Society of Mechanical Engineers will be held in Detroit on June 23rd to 26th. The papers to be presented can be seen in last issue. The Gas Power Section of the society will hold a session, and the society for the Promotion of Engineering Education and the Society of Automobile Engineers, will hold a meeting in Detroit at the same time.

AN ART CATALOGUE.

An excellent example of what is possible in the engraving and printing art is exhibited in the latest catalogue of the Toronto Engraving Co. This is entitled "Quality, Some Proofs From Toronto Engraving Co., Limited," and contains reproductions of illustrations used in several machinery catalogues, including those of several of the largest machinery firms in Canada. Anyone anxious to have on hand examples of the finest of engraving work, which will

show up machines to perfection, should secure a copy of this catalogue.

This catalogue includes reproductions of color plates, several of which have appeared among the advertising pages of Canadian Machinery.

Nothing finer than this has been turned out in the form of a catalogue.

REMINGTON OIL ENGINE.

An oil engine that has met with success in the United States is now being placed on the Canadian market. Fig. 1 shows a stationary engine, but they are built for either stationary or marine work. It is known as the Remington Oil Engine, and is of the valveless, two-cycle type.

One of the features of the engine is the method of feeding the oil. Near the end of the stroke a small oil pump, mounted on the crankcase shown in Fig. 2 and controlled by the governor, injects the proper amount of oil through the nozzle into the compressed and heated air. The spray of oil is ignited by the nickel steel plug, which is kept red hot by the explosions because the iron wall surrounding it is protected from radiation by the hood. By the burning of the oil spray in the air the pressure is gradually increased and the piston forced downward this being the power or impulse stroke. The power is regulated by modifying the stroke of the oil pump, which may be done by hand or automatically by the governor in the flywheel.

Governor and Control.

The governor is of the centrifugal type. It has an L-shaped weight, pivoted to the piece attached to the flywheel. As the engine speed increases, the weight tends to swing outward toward the flywheel rim, and thereby moves the arm attached to it so as to shift the cam along the crankshaft. This cam turns with the shaft, and operates the kerosene oil pump. According to the position of the cam on the shaft, it will impart to the pump plunger a long or a short stroke, thereby injecting more or less oil into the cylinder. The long lever pivoted on a bracket moves with the cam and is used for controlling the engine's speed by hand. To stop the engine the handle of the lever is pulled towards the flywheel, thereby interrupting the pump action altogether.

The handle of the lever contains an adjustable stop device which acts against the lever segment. This device is extremely useful in operating the marine engines, as it permits the operator to set the stop for slow speed when desired, and yet prevents the engine from racing when the clutch is thrown out. If desired, the control lever is readily connected by wires and bell cranks to a lever in the pilot house.

The main bearings are taken out by removing the top caps, thereby making it possible, if ever necessary, to scrape them. The crankpin bearing is exposed by removing the handhole cover of the crankcase. The cylinder is provided with a water jacket which runs its full length. Rising from the centre of the head is a hollow cast iron projection which contains the nickel steel igniter plug by which the oil spray is kindled. This plug is practically indestructible by heat.

The crankshaft is of high carbon crucible steel, and is cut from a solid billet instead of being drop forged. The bearing surfaces are finished by grinding. Counterweights for balancing the cranks and connecting rod are attached to the cranks by steel studs. The piston has from four to seven rings, one of them being located at the bottom of the piston, where it serves to prevent air compressed in the crankcase on the down stroke from escaping past the piston to the exhaust or suction ports. The connecting rod is a taper turned steel forging. The wristpin bushing is bronze and solid. The mainshaft and crankpin bearings are phosphor bronze lined with hammered babbit metal.

Lubrication of all the important bearing points is effected by a Lavigne force feed oiler, driven by a belt from the crankshaft. This oiler consists of a series of small plunger pumps which deliver oil in definite quantities as long as the engine runs, and ceases feeding when the engine stops. Oil is fed in this manner to the piston, the two main bearings and the crankpin bearing.

To start the engine, the hollow cast

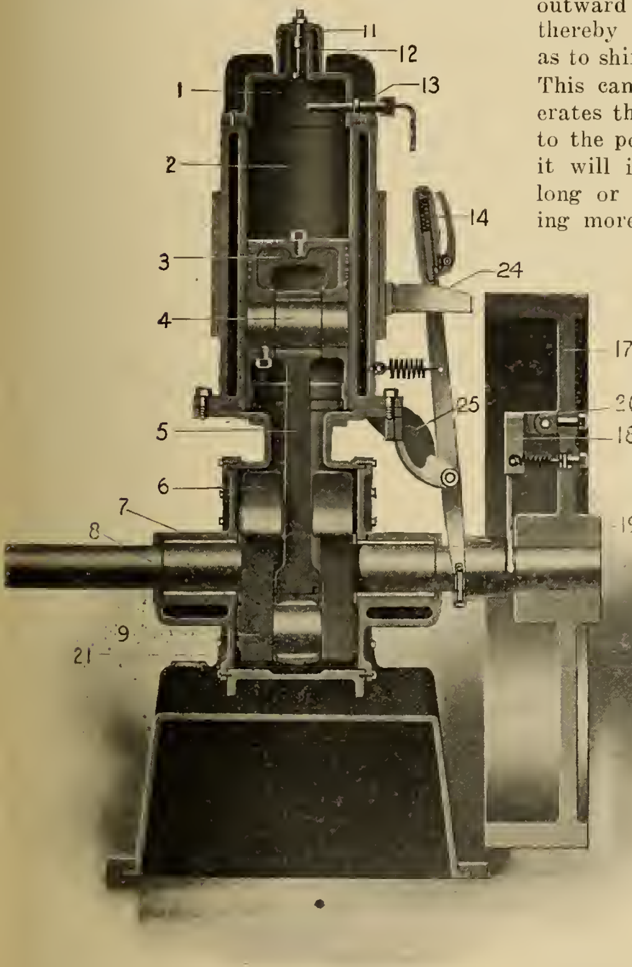


Fig. 1.—Longitudinal Section Through Engine.

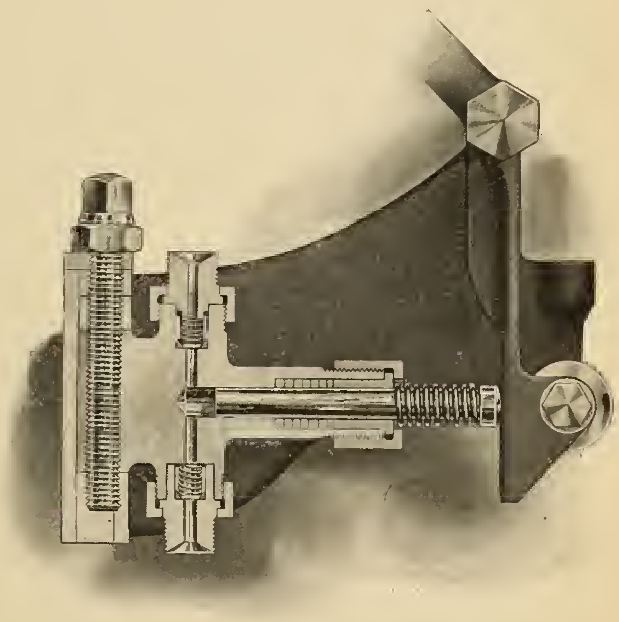


Fig. 2.—Kerosene Pump in Section.

iron projection rising from the cylinder head is heated by the kerosene torch furnished with the engine. When it is hot, a single charge of oil is injected into the cylinder by working the hand lever shown in Fig. 3. The flywheel is now turned smartly backward, thereby compressing the charge, which ignites before the piston reaches the highest point and starts the engine in the forward direction. These engines are being placed on the Canadian market by Dinning & Eckenstein, 503 and 504 Merchants Bank Building, Montreal.

The Necessity for a Good Organization in Business

A Good Cost System is Essential—One Firm in Ottawa, who Lost their Plant by Fire, Saved Thousands of Dollars by a Complete Stock Inventory

Every event in history teaches its lesson. A complete cost system will sometimes save more than the cost of its upkeep. It is an efficient cost system when it pays for itself and every manufacturer should be open for ideas to make his cost system of more use to him or that will lead to a better organization of his business. On the 25th of July, 1907, Ottawa was visited by a fire that did over $400,000 worth of damage. Among the factories destroyed was the entire manufacturing plant of the Library Bureau of Canada, Limited. The quickness with which their insurance claims were adjusted is the best recommendation for the keeping of a complete cost system. To be of much use the system must be simple, accurate, systematic and economical. The one adopted must be adapted to the special requirements of the manufacturer.

The most useful system is the one that is most complete and which will show at any time full information as to stock on hand and work finished in each department. The Library Bureau of Canada, Limited, being devisers and manufacturers of business systems, had a careful record system in operation in their plant. An important part of this system is the so-called perpetual stock inventory. Each night it tells the stock-keeper just how much raw material has been used, how many articles are in process, how much completed and the exact balance on hand, both of raw material supplies and of every item of manufactured goods.

This perpetual stock record is kept on cards filled in trays, one card for each article of stock, or, if several sizes of an article are carried, one card for each size. The cards are arranged alphabetically by name of article, or by catalogue number when possible. Guide cards with either the name or number are placed between every ten cards to facilitate handling. The form of card to be used is, of course, determined by individual requirements.

If there are a great many sizes of each article, a tab card can be used to advantage. For example, in a lumber stock record, the different thicknesses are shown on the tabs arranged behind the guide card bearing the name of the wood. Tabs represent different thicknesses of the same width. Credit postings are made to the record by the stock-keeper either from a duplicate requisition or from invoices when goods are received and debit postings from customers' orders on material cards when goods are given out.

With such a stock record system in use in their factory, the Library Bureau was able to obtain an immediate adjustment of their fire loss. This meant a saving of thousands of dollars in the adjustment of these fire losses.

This stock inventory was equally valuable in another way. It gave the Library Bureau of Canada, Limited, accurate information as to amount of stock in each different line which had been carried so that it was possible to put in re-stocking orders immediately and to decide which articles should be manufactured first. This form of stock inventory has been applied to many lines of business and manufacturing.

The result of having an efficient cost system may be seen from what the Library Bureau was enabled to accomplish in a very short time after the fire. At once work was started on their new factory, Isabella St., Ottawa, and the necessary machinery was installed for the manufacture of business systems. It will be of interest to many to read a description of the process through which the cabinets pass until at last they reach the shipping department ready for installation in the business offices. The new plant of the Library Bureau was completed last December and contains many interesting features. A modern natural air draft kiln with a capacity of 60 000 square feet of lumber, a complete shaving exhaust system, 12 electric motors, arranged so that the large machines are on separate drives and the smaller ones grouped, were installed. The buildings are arranged in the shape of a quadrangle with an open court in the centre, giving light from all sides. At one corner the lumber enters the cutting off room on transfer trucks direct from the dry kiln. The first machine through which the stock is put is a roughing planer to take off the rough outer surface and show the color and figure. The boards are then carefully sorted and matched. Two swing saws, a self-feed rip saw and a 10-inch molder are also in this room. After the lumber leaves each one of these machines it is piled on trucks ready to move forward to the next department, where are grouped the rest of the machines. This second room is 60x60 feet, and contains two planers, two shapers, two rip saws, two jointers, a chain mortiser, a 60-inch sander, and a single end tenoner. Here the lumber is made ready for the cabinet-makers to assemble. Upstairs over this room is the cabinet-room where the stock goods are made. An electric elevator takes the stock up on trucks. It is placed at the various benches which line the walls, where the cabinet-makers make the desks and cases. The L. B. dovetailing machines, with belt sanders and boring machines are placed here.

Going downstairs again, one enters a room running at right angles to the machine room and 130 feet long by 37 feet wide. Here bank counters and contract work are put together and set up. Eight large skylights make this room as bright as out-of-doors. Just off this room and between it and the machine room, a glue room has been built, where special glue cookers have been installed, besides large veneer presses. On to the third side of the quadrangle is the finishing room, which contains the varnish room, built so that no draft can touch the work while being coated, thus preventing any chance of the varnish cracking.

The packing and shipping rooms follow this. They lead through a large fireproof door at the end of the building, to the tracks of the Grand Trunk Railway, which has a siding into the works. On the fourth side of this square is the boiler room and machine shop. Here an automatic knife grinder and the emery wheels are placed.

The office of the Library Bureau is a short distance from the works and here are the accounting, cost and drafting departments.

Agencies have been opened up in Toronto, Montreal, Winnipeg and Halifax.

OBITUARY.

Mr. Arthur Koppel, the founder of the Arthur Koppel Co., New York, died suddenly in Berlin, Germany, on May 13 of heart failure in his 57th year. Mr. Koppel was born in Dresden, Germany, in 1851. He started into business for himself in 1876, and has built up a company which now owns fifty-two branch houses, all over the world, eight plants, of which three are in Europe, one in France, one in Austria, one in Russia, one in Spain, and one in the United States. There will be no change in the concern.

Mr. H. H. Henshaw, who was connected with the old Royal Electric Co., and at one time manager of Allis-Chalmers-Bullock Co., Ltd., Lachine, died at St. Hyacinthe on May 15th.

INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News.

Machine Shop and Foundry News.

The stock of Terreau & Racine, founders, Quebec, was damaged by water in a recent fire.

The Sydney Foundry & Machine Works, Sydney, C.B., will erect a new structural shop.

Tero and Son, Dundalk, Ont., have succeeded Carr and Scott in the foundry business there.

The Moose Jaw Machine Works, Ltd., Moose Jaw, Sask., have been sold to John Bellamy.

The James Robertson Company, Montreal, is building the first lead sheet plate foundry in Canada.

Dunnville, Ont., proposes erecting a foundry and machine shop for manufacturing gas engines, etc., and handing the plant over to a company.

The British Columbia Marine Railway Co. have purchased S. Hallander's machine shop at Vancouver and will enlarge and improve the plant by installing new machinery and electrical equipment. They will also add to the dry dock.

Electric Power and Transmission.

Sherbrooke, Que., has taken over the electric light plant there.

Indian Head, Sask., will spend $10,000 on an electric light plant.

Fire did $35,000 damage to the premises of the Jones & Moore Electric Co., Toronto.

Ratepayers of Ladysmith, B.C., will be asked to vote $25,000 for an electric light plant.

The Taylor power plant at Ragged Chutes, near Latchford, Ont., will be completed in the fall.

Fernie, B.C., may purchase for $50,000 the electric light plant, owned by a private company in that town.

The Port Hope Electric Light and Power Company's plant has been totally destroyed by fire; loss, $50,000.

The city of Sherbrooke, Que., has taken over the electrical plant and it will now be run as a municipal concern.

The Dominion Electric Co., makers of incandescent lamps of all sizes, has opened its factory at St. Catharines, Ont.

The Ontario Government has closed a three-years' contract with the Cataract Power Co. for the supply of power to Hamilton Asylum.

The city of Toronto has signed a contract guaranteeing to take 10,000 horsepower from the Hydro-Electric Power Commission. Preston and St. Thomas have also signed contracts for power from H. E. P. C.

The Robert Co. generating power at Cedar Rapids and the Beauharnois Canal will enter Montreal and supply power for industrial purposes at $25 per horsepower per year for a ten hour day, for a 100 to 500 H.P. contract. Rates range from $25 to $35, according to the power required.

Wisconsin capitalists have taken over and are equipping the Bull River Power and Light Company, on Bull River, near Fort Steele, B.C., with a 10,000 horsepower electric system to supply light and power to Cranbrook, Fernie, Hosmer, Elko, Marysville and Moyie, and possibly the Crow's Nest branch of the C.P.R., when that section is electrified.

Saw and Planing Mill News.

Hanna Bros., Ridgeway, will erect a planing mill at Fort Erie, Ont.

Emery Provost's planing mill at St. Vincent de Paul, Que., was burned recently.

The sheriff is in possession of the Nipissing Planing Mills, Ltd., North Bay, Ont.

J. A. Sayward, Victoria, B.C., is improving his lumber mill and installing new machinery.

Robertson & Hackett's sawmill and sash and door factory, Victoria, B.C., was burned; loss, $70,000.

J. R. Booth's lumber mill, Ottawa, commenced work on May 1, giving employment to 1,200 men.

David McMechan's lumber and stave mills, Highgate, Ont., were destroyed by fire. Loss, $20,000.

The Fraser River Sawmills, New Westminster, B.C., have been bought by a syndicate composed of the Swifts the Chicago meat packers, and Davidson & McRae, land agents at Winnipeg and Toronto. It is proposed to spend $3,000,000 on the plant.

Lumber mills will be built by a Kansas timber concern on Nootka Island and Alberni canal, B.C., shortly.

Taylor & Jamieson, of Scotstown, Que., are rebuilding their sawmill and will install up-to-date machinery.

The steam shingle mill of Messrs. Tilton & Raymond, near Coaticook, Que., has been totally destroyed by fire.

Work of building the Papineauville, Que., Lumber Co.'s sawmill is now under way. Modern machinery will be installed.

The McLaughlin's mills at Buctouche, N.B., including their carding and sawmills, have been destroyed by fire. Loss, $45,000.

Dumas & Grughel Bros., who control the Eganville (Ont.) planing mill and sash and door factory, are equipping the mill with up-to-date machinery.

Railroad News.

The C.P.R. will double track its line between Peterboro and Montreal.

The Northern Pacific propose building a line from Pembina, N.D., to Winnipeg.

The C.P.R. are arranging to have a line of boats run between Gladstone, Mich., and Goderich, Ont.

A railway line is proposed to be built between Brockville and the country in the north of Lanark county.

The Yorkton-Regina branch of the G.T.P. will be one of the first branch lines of that system built in Saskatchewan.

The Grand Valley Railway Co. will substitute 80-pound rails for those now down on the line between Brantford and Galt.

The C.P.R. will replace the wooden spans and trestles on the line between Calgary and the coast with steel structures this summer.

Powers & Brewer, contractors, Woodstock, N. B., have contracts for cement work on the G. T.P. and C.P.R. lines worth $500,000.

Moncton, N.B., will apply to the Legislature for a charter to construct and operate a steel railway and also build a line to Shediac.

Contractors expect to complete the extension of the T. & N.O. Railway to the Transcontinental junction before the close of the present season.

The C.P.R. are planning the construction of a second line across British Columbia, which would lessen the trip to Japan several hundred miles.

Construction on the Ontario & West Shore Electric Railway between Goderich and Kincardine will begin early in May, and the road will be completed during the present season.

During the coming season the Canadian Pacific Railway will expend $250,000 on its navigation department in the Kootenays, B.C. At the shipyards they are preparing to build a tug and a barge and other additions to the fleet are in contemplation.

The Vancouver, New Westminster and Yukon Railway from Vancouver to New Westminster, has been formally handed over to the Great Northern Railway. The wharves and terminals on False Creek, Vancouver, will be erected shortly at a cost of about $7,000,000.

The Canadian Pacific Railway Co. will erect four new bridges in British Columbia; one between Cowichan and Duncan, B.C., one between Cobble Hill and Shawinigan, B.C., a steel bridge across the Chemainus River, and one across the Nanaimo River.

Municipal Undertakings.

Guelph may build a municipal abattoir.

St. Thomas, Ont., may spend $24,000 on bridges.

A steel and concrete bridge will be erected at Poplar Hill, Ont.

Montreal will spend $800,000 in street paving during the coming summer.

St. Thomas, Ont., city council is contemplating installing a $2,000 ammonia plant.

Winnipeg, Man., will submit by-laws asking for $100,000 for an isolation hospital, $15,000 for a morgue, and $125,000 for additional hospital purposes.

Guelph water commissioners will erect a new pump house and a new concrete standpipe.

Oil Springs, Ont., has granted a $2,000 bonus for the establishment of a flax mill there.

A new filtration plant building will be erected in connection with Stratford's waterworks system.

The city hall, Montreal, is to be enlarged by the addition of two storeys to the present building.

Malahide Township, (Ont.) council will replace the steel bridge at Gravesend, Ont., with a cement arch.

The Kingston Foundry Co. has been awarded the contract for erecting iron fire escapes on the Kingston general hospital.

On May 5 by-laws were passed by the Ottawa, Ont., council for the issue of $112,094, to be expended on local improvements.

Chippewa, Ont., carried a by-law to provide a site for the British-Canadian Smelters, Ltd., on which to erect a smelting plant.

The Toronto Board of Control is asking for tenders for the construction of a steel and concrete floor for the main pumping station.

Saskatoon, Sask., has carried by-laws providing for a $55,000 municipal hospital, a $25,000 fire hall and equipment, and a $20,000 new C.P.R. bridge.

Contracts have been awarded in connection with Palmerston's (Ont.) waterworks system to the Gartshore-Thompson Co., Hamilton, pipe and special castings, $11,658; Canadian Fairbanks Co., Toronto, hydrants, boxes and spindles, $2,082; the Hunter Bridge and Building Co., Kincardine, standpipe 100 feet high, $5,500.

General Manufacturing News.

The Chatham Motor Co. is once more in operation.

J. B. Beveridge is building a pulp mill in Millerton, N.B.

W. Lunenfeldt will build at $15,000 metal factory in Toronto.

The Plow Works Co. will erect a factory at Port Stanley, Ont.

The Rock Glen Power Co., Arkona, Ont., has obtained a charter.

The Manchester Cereal Co.'s factory, Ingersoll, has been burned.

W. N. Drader's box factory, Chatham, Ont., has started operations.

The Ingersoll Canning Co. propose enlarging their Vienna, Ont., factory.

The Canadian Steel Co. will build a $60,000 factory in Campbellford, Ont.

The British Canadian Smelters, Ltd., will erect a plant at Chippewa, Ont.

The Del Nord Smelting & Refining Co., Ville Marie, Ont., are building a plant.

The Borden Condensed Milk Mfg. Co. will erect a factory at Tillsonburg, Ont.

The Crossin Piano Co. will erect a factory to employ 50 hands at Brampton, Ont.

The Miller Extract Co. are talking of putting up a paper mill in Millerton, N.B.

G. W. Rihchester's carriage works at Edmonton, Alta., were damaged by fire.

The Great West Townsite Co. propose erecting a cement works in St. John, N.B.

Glover's basket factory, Burlington, Ont., has been destroyed by fire. Loss, $8,000.

The Supreme Heating Company, Welland, has opened its stove manufacturing plant.

The P. L. Robertson Mfg. Co., Milton, Ont., will erect a screw factory immediately.

A. E. Petty, Hamilton, Ont., will locate an emery wheel factory in Brantford, Ont.

The National Mfg. Co., Pembroke, Ont., may erect a branch factory at Regina, Sask.

The Illinois Car Wheel Co. will locate its Canadian branch at North Sydney, C.B.

The Vessot Flax Pulling Machine Co., Ltd., St. Mary's, Ont., have obtained a charter.

The Canadian Smallware Co. will erect a $36,000 plant at St. Mary's, Ont., if the town

will guarantee the $20,000 bonds of the company.

The Steel Culvert Co., Madison, Wis., propose erecting a branch factory in London, Ont.

An order has been granted to wind up the Cornwall Paper Mfg. Co., Ltd., Mille Roche, Ont.

The Standard Brass Manufacturing Co. has removed its plant from Sarnia to Windsor, Ont.

An addition is to be made to the plant of the Dennis Wire and Iron Works Company, Ltd., London.

The Imperial Furniture Company's premises, Hull, Que., were damaged by fire to the extent of $7,000.

The Galt Brass Co.'s factory, Galt., Ont., is exceptionally busy, a night staff being found necessary.

C. P. Schindler is contemplating erecting a plant for manufacturing sand lime bricks at Vancouver.

The Canada Organ Co., Woodstock, Ont., will locate in London, if that city will grant a $5,000 bonus.

The Ingersoll (Ont.) Foundry Co. are enlarging their plant by taking over the Bell Mill in that town.

The Horlick Malted Milk Co., Racine, Wis., is considering the erection of a branch factory in London, Ont.

F. R. Lingham and H. Corby, Belleville, Ont., will erect a large lime and cement works in Shannonville, Ont.

The Ross Rifle Co., Quebec, will make 52,000 bayonets for the Dominion Government, at a cost of $5.25 each.

The factory erected last summer by the Modern Bedstead Co. at Cornwall, Ont., collapsed recently. Loss, $[illegible].

Steel's planing mill, Smith's Falls, Ont., has been damaged by fire and the machinery sustained considerable loss.

C. Schmidt & Co., Hamilton, have leased Whitman's planing mill, in Brantford, Ont., for a branch matress factory.

The Garry Brook Mfg. Company have offered to put up a plant in Pembroke, Ont., if that town will grant tax exemption.

A Renfrew company, headed by J. E. Barnet, has bought the old Cumming factory, and will manufacture cream separators there.

The American Canning Co., New York city, are contemplating erecting a $250,000 plant for manufacturing tin cans at Montreal.

Marine and General Engineering, Ltd., expect to have their Sydney, C.B., plant in partial operation about the middle of June.

Beatty Bros., manufacturers of hay tools and litter carriers, Fergus, will erect a blacksmith shop addition to their present premises.

The plant of the Dominion Coal Co., Port Morien, C.B., recently destroyed by fire, with a loss of $100,000, will be rebuilt at once.

A new surface plant is being installed in Duchess mine, Cobalt, Ont., and a new plant will be put in the Silver Queen mine also.

Wm. Harland & Sons, London, Eng., have purchased the Victor Varnish Co.'s works in Toronto, and will spend $[illegible],000 in improvements.

The Pacific Coast Gypsum Co., Tacoma, Wash. will erect a hard wall plaster factory at Vancouver, B.C., for Evans, Coleman & Evans, of the latter place.

Sydney, C.B., proposes to exempt the plant of the Illinois Solid Forge Car Co. from taxation for ten years, and also give that company a building site.

F. T. Ranney, Detroit, and R. Loveland, Sandwich, Ont., propose erecting a $500,000 pulp mill at Sandwich, if the duty on pulpwood entering the States is removed by Congress.

The Granby Consolidated Co., Grand Forks, B.C., will expend $250,000 on enlargements and improvements. Some of this amount will be spent on machinery and electrical equipment.

The Canadian Antimony Company, Ltd., of Fredericton, N.B., intend installing a ten-drill air compressor, a concentrator and other machinery at Lake George, York county, N.B.

In the fire which recently destroyed the Hobbs Glass Works, London, Ont., the Canada Furniture Company's premises were damaged to the extent of $125,000. Rebuilding will be commenced at once.

Thomas Skinner, a C.P.R. director, has a proposition to settle the Dominion Coal and Steel quarrel. His plan is to raise $35,000,000 in England and form a new company to take over both corporations.

In order to facilitate the handling of their western business, Peter Lyall and Sons, building contractors, Montreal, have organized a western company, with offices at Winnipeg which will have complete control of the firm's work and business interests west of the Great Lakes. It is stated that the company has a capital of $250,000, that the president is Peter Lyall, the vice-president and manager, Geo. A. Mitchell, and Peter Lyall, Jr., secretary-treasurer. The firm has been established in the west for some years.

J. H. Perkins, Mansonville, and Howard Parker, Nashua, are negotiating with the city council, Sherbrooke, in reference to the establishment of a factory for the manufacture of paper machinery in that city.

The village of Danville, Que., is loaning $25,000 to the Danville Furniture Co., organized by W. A. Caton. The company is capitalized at $100,000, and a new factory will be equipped and running within twelve months.

The Whitman & Barnes Mfg. Co., Chicago, Ill., announces that plans have not been formulated concerning the plant at St. Catharines, Ont., recently destroyed by fire. The company is awaiting the adjustment of its insurance.

J. L. Thomas, representing Johnston, McConnell & Allison, London, Ont., has been promoting in England a company to manufacture brick in St. Thomas and Dorchester, Ont. The company will be capitalized at $250,000, and the machinery will cost $[illegible],000.

Charles M. Schwab, former president of the United States Steel Corporation, is interesting himself in the Dominion Iron and Steel Company, Sydney, N.S. He has just returned from a visit to Sydney, and it is stated that he and other capitalists have been buying Dominion Steel stock rather extensively for some time.

Waterworks and Sewage.

Brantford's (Ont.) waterworks system will be extended.

A sewerage system will be constructed in Kitsalano, B.C.

Markdale, Ont., will spend $20,000 on waterworks system.

Hirsch, Sask., will spend $75,000 on waterworks extensions.

Port Stanley citizens will vote on a [illegible] waterworks system.

A sewerage system will be constructed in Preston at an early date.

Finch, Ont., has passed a by-law to spend $4,600 on sewer construction.

Lunenburg, N.S., will spend $25,000 on waterworks and sewerage systems.

Cornwall, Ont., proposes to construct a $4,600 sewer on its main street.

Chilliwack, B.C., will raise $17,000 for drainage and sewer extensions.

Indian Head, Sask., passed a by-law to extend waterworks system at a cost of $[illegible],000.

The Montreal Waterworks Department has asked for $500,000 for new works during the summer.

Saskatoon, Sask., will spend $130,000 on extensions to its waterworks and sewerage systems.

Fernie, B.C., may purchase, for $50,000, the waterworks system now controlled by a private concern.

London, Ont., ratepayers will vote at an early date on a new water supply system to cost $560,000.

Portage la Prairie, Man., ratepayers carried a by-law to spend $50,000 on an auxiliary waterworks system.

Moose Jaw, Sask., proposes to submit a by-law to raise money to extend its waterworks and sewerage systems.

Indian Head, Sask., will spend $10,000 for waterworks extensions and $53,000 for waterworks and purchase of Squirrel Hill.

The Victoria, B.C., waterworks department is asking for tenders for the supply of 70 tons of pig lead and for certain gate valves.

Regina, Sask., will on May 20 vote on by-laws authorizing the city to spend $90,000 on waterworks system extensions, and $70,000 on sewerage system extensions.

Building Notes.

Meaford, Ont., will erect a $15,000 town hall.

A new post office may be erected in Waterloo, Ont.

A Carnegie library will be built at Pembroke, Ont.

Winnipeg's Y.W.C.A. propose to erect a $75,000 building.

The G.T.P. will build a $3,000,000 elevator at Fort William.

A new Catholic church will likely be erected in Calgary, Alta.

The Glover dye works, Quebec, has been destroyed by fire.

A fruit cannery will be erected at Chilliwack, B.C., by a company composed of M. H. McLeme, A. B. McKenzie, F. N. Crankshaw and others.

Oakville, Ont., carried a by-law to erect a $26,000 High school.

W. J. Mable, Victoria, B.C., will erect a $12,000 carriage factory.

Tenders are called for a $90,000 school building at Lethbridge, Alta.

A $25,000 Catholic boarding school will be erected at Fort William.

The B. F. Graham Lumber Co. will erect a $150,000 mill at Esquimalt.

The Independent Brewing Co., Hamilton, will put up a $200,000 brewery.

The site for the new Bank of Nova Scotia Winnipeg, is being cleared.

Merrick, Anderson & Co., Winnipeg, will erect a $28,000 tar paper factory.

Verdun, Que., will erect a $40,000 town hall, fire and police station building.

Farmers about Duck Lake, Sask., will erect a flour mill and elevator there.

The elevator at Goderich, Ont., is being enlarged to 1,000,000-bushel capacity.

The Molson warehouse, Montreal, will be reconstructed, at a cost of $40,000.

A $21,000 German Lutheran church and parsonage will be built in Montreal.

A $15,000 gymnasium building is proposed to be erected by the Toronto Y.W.C.A.

Prince Albert, Sask., passed a by-law to spend $90,000 for a new High school.

The Mahon block, Victoria, B.C., recently destroyed by fire, will be rebuilt at once.

The Lethbridge, Alta., school board is calling for tenders for a $90,000 school building.

The C.P.R. will erect a 10,000,000-bushel elevator at Victoria Harbor, on Georgian Bay, Ont.

Lyman & Sons, wholesale chemists, Montreal, intend erecting a large warehouse this summer.

The Imperial Trust Co., Vancouver, B.C., will erect a thirteen-storey structure costing $400,000.

Henry Bros., dry cleaners and dyers, Winnipeg, will erect a $15,000 plant in St. Boniface, Man.

Oswald Hinds, Manitowaning, Ont., will erect a block of stores and dwellings almost immediately.

Tenders will shortly be called for the erection of the $45,000 "Men's Own" club building, Winnipeg.

The new car works at Fort William will cost $200,000; and on the new wire works $60,000 will be spent.

The Ontario, Manitoba & Western Land Co., Winnipeg, will erect a $25,500 store and dwelling block.

The Sisters of Our Lady of the Missions, Brandon, Man., will erect a new convent on their property there.

Montreal's Technical School Commission has purchased a site for the erection of the $350,000 school building.

The Maple Leaf Flour Mills, Kenora, Ont., burned some months ago, are being rebuilt by Geo. H. Archibald, Winnipeg.

M. B. Dickenson and Jno. V. Calver, Sydney, C.B., are organizing the Marine & General Engineering Co., Ltd. The company propose erecting a $23,000 factory.

Consideration has been promised a Fredericton, N.B., civic deputation by the Railway Department, Ottawa, for the construction of a $50,000 railway depot at Fredericton.

The Public Works Department, Ottawa, are calling for tenders for a movable dam, steel service, and highway bridges and repair shop at St. Andrew's Rapids, Red River, Man.

Companies Incorporated.

The Hurdman Lumber Company, Ltd., Ottawa, Ont. capital, $20,000; to manufacture furniture, etc.

Friction Heat-Light Co., Ltd., Toronto; capital, $60,000; to manufacture boilers, heaters, furnaces, lamps, etc. Provisional directors, Geo. Paton, Jas. Linton, Alex. Laidlaw, And. Reading and W. M. Hall.

Canadian Steel Rolling Mills Company, Limited, Campbellford, Ont.; capital, $100,000; to manufacture and roll iron and steel. Provisional directors, A. H. McKeel, C. E. Dunk, W. J. Doxsee, T. S. Tait, D. Kerr, W. Rudkins and Jas. Davidson.

William Peace Company, Limited, Hamilton, Ont.; capital, $40,000; to manufacture and deal in wood, iron and metalware of all kinds. Provisional directors, W. L. Pence, S. G. Richardson and W. E. Millward.

The Canadian Instrument and Testing Company, Limited, Montreal; capital, $[illegible]; to manufacture electric heaters, furnaces, etc. Di

rectors, E. M. B. Archibald, C. Archibald, W. A. Henry, H. B. Stairs and R. V. Harris.

Aylmer Pump and Scale Company, Limited, Aylmer, Ont.; capital, $90,000; to take over the Aylmer Iron Works Company and to manufacture pumps, scales, tools, etc. Provisional directors, S. H. Chapman, J. H. Glover, E. Fairbairn, R. A. McCarter and Wm. S. Caron.

The Peerless Brick and Tile Co., Limited, Ottawa, Ont.; capital, $150,000; to manufacture brick, sewer pipes, cement, paints, artificial stone, etc. Provisional directors, W. S. Odell, J. A. Ballantyne, W. C. Perkins, H. H. Williams and J. G. Gibson.

Trade Notes.

John Ervin, Bridgetown, N.S., is promoting a company of English capitalists to establish blast furnaces at Port Wade, N.S.

The Bateman's Machine Tool Co., Leeds, Eng., has a repeat order for two high-speed planers from the Egyptian State Railway.

The Schaake Machine Works Co., New Westminster, B.C., has the machinery contract for the Moresby Island Lumber Co.'s new mill at Queen Charlotte, B.C.

The Public Works Department of Alberta has awarded the contract for 700 miles of long-distance telephone material to the Northern Electric Co., of Montreal and Winnipeg.

The Chapman Double Ball Bearing Co., Toronto, have received an order for the complete equipment with ball bearings of the G.T.R. shops at Stratford, and at Battle Creek.

Tenders have been invited by the Department of Marine and Fisheries, Ottawa, for the furnishing of one machine for bending steel boiler plates to be delivered at the Government shipyard at Sorel, Que.

The Glacier Metal Co., Richmond, Va., and Canadian office at 320 St. James Street, Montreal, will shortly start the erection of a new plant in Manchester, Va., for the manufacture of their anti-friction metals.

At the annual meeting of the E. & T. Fairbanks, Co., Ltd., Sherbrooke the following officers were elected: H. M. Turner, president; C. H. Turner, vice-president; P. F. Hazen, secretary; J. C. Clark, treasurer.

The Dominion Foundry Supply Co., Ltd., of Montreal, have been appointed exclusive agents for Canada for the "Outerbridge" silicon alloy for softening, strengthening and cleaning cast iron. A sample will be sent upon request.

The Montreal city council has decided to purchase from the John McDougall Caledonian Iron Works Company a 12-million gallon Worthington pump to cost $29,465. According to specifications, the pump must be delivered within nine months.

The Hamilton Powder Company, of Nanaimo, B.C., have recently ordered a 14-in. tandem compound Robb-Armstrong engine for direct connection to an electrical generator. This is a duplicate order, a similar engine having been installed about a year ago.

The Robb Engineering Company have recently received an order from the Western Fuel Company, of Nanaimo, B.C., for one 24x42-in. type "F" Robb-Armstrong Corliss engine. This engine is of 600 horse-power capacity and is the third engine supplied the Western Fuel Company in the past twelve months.

Walter B. Snow, publicity engineer, has recently increased his facilities by removal to larger quarters at 170 Summer Street, Boston, Mass., and the establishment of an addressing and mailing department in connection with which select mailing sheets will be maintained for the special use of his clients.

Jones & Glassco, 334 Notre Dame St., Montreal, have secured the Canadian agency for Dobbie, McInnes, Ltd., Glasgow, Scotland. This latter company manufactures engine indicators, pressure, vacuum and hydraulic gauges, revolution counters, high-class engine and boiler fittings and furnace deformation indicators, which will be carried in stock by their Canadian agents.

In the Market for Furnaces.

The Glacier Metal Co., Richmond, Va., are in the market for furnaces for the manufacture of babbitt metal and brass. They are also looking for information on reclaiming metal from drosses and extracting tin from old cans.

Opening Canadian Factory.

An announcement has been made by the Standard Sanitary Manufacturing Company, Pittsburg, Pa., through their Canadian sales agents, Messrs. Thos. C. Collins & Son, of Montreal, that in order to take care of their Canadian business it has been decided to erect a factory in Canada. This will enable the firm to take better care of their growing business and to further increase their patronage. The Standard Sanitary Manufacturing Company have not previously manufactured goods elsewhere than in the United States, operating factories in Pittsburg, New Brighton and Lewisville, but they have found a Canadian factory necessary to care for their growing business in this country.

Annual Meeting of C.M.A.

The annual gathering of the C.M.A. will be held in Montreal on September 15, 16 and 18 next. They will be welcomed by the city and the M.S.R. will give the delegates a free street car drive around the city.

New Testing Laboratories.

The Canadian Laboratories have been started at 37 Melinda St., Toronto, for the commercial testing and analyzing ores, fuels, alloys, cements, pig iron and other products, special attention being paid to foundry work. W. K. McNeill, B.Sc., is manager.

New Manufacturers' Agency.

J. J. Shortall, of the McLaren Belting Co., has opened an agency at 294 St. James St., Montreal, to handle mill supplies. He has already secured the agencies for motors, belting, hose, rubber goods, fire extinguishers, incandescent lamps, waste, oil, babbitt, packing, etc. Mr. Shortall has a good connection among manufacturers and has had considerable experience in this line of work.

"Thermit" Branch Works in Toronto

The Goldschmidt Thermit Company announces the establishment of an office and works at 103 Richmond Street, West, Toronto, Canada. The new branch was opened for business May 1st, and is under the management of E. C. Rutherford, Toronto. Mr. Rutherford is a Canadian by birth, and has a wide acquaintance among the business men of the Dominion, having been for several years the manager of the Wagner Air Brake Company, and of the Canadian Brake and Supply Company. A complete stock of Thermit and appliances will at all times be carried at Toronto, and the branch organization will be in a position to execute promptly the welding of heavy steel sections, such as stern posts of steamships, crank shafts, etc., and other broken steel sections. A fully equipped repair shop will be in operation for the repair of steel castings up to one thousand pounds in weight.

New Contracting and Engineering Firm.

Messrs. Stewart & McTaggart, is the name of a new contracting and engineering firm, with offices in the Federal Life Building, Hamilton, Ont. They will make a specialty of structural steel for all classes of structures, conveying machinery, rolling mills, steel works, foundries, cement plants, sugar factories, power houses and manufacturing plants in general.

A. L. McTaggart is an honor graduate of the School of Practical Science, Toronto, and has had thirteen years' experience in designing and installing conveying machinery, steel plants, blast furnaces, etc.

J. A. Stewart is an honor graduate of Queen's University, Kingston, and the School of Practical Science, Toronto. He has had 12 years' experience in railroad bridge departments and with structural steel concerns. For the last five years he has been engineer for the McClintic Marshall Construction Co., Pittsburg, in charge of estimating and designing all classes of structures.

New Railroad Shops for Toronto.

The Canadian Northern Ontario Railway will at an early date construct on Eastern Avenue, Toronto, a machine shop for the repair of rolling stock, and also a roundhouse. The plans for these structures will be ready early in June.

It is expected that from fifty to one hundred men will be employed in and about these shops at the start. The number will be increased with the traffic and necessities of the Canadian Northern Ontario road. In reference to the Moose Mountain smelters and blast furnaces, D. D. Mann said: "We haven't dropped the scheme by any means. We are just lying low for a while. The fellows who were going to put their money into it are not so keen about it just now. There isn't such a demand for the products just now either."

The American Can Company's Canadian Branch.

The American Can Co. has been looking over the ground in Canada since the beginning of the year with a view to establishing a branch in this country. Negotiations are now under way between the Acme Can Works, Montreal, and the American Can Co., New York, which will in all probability result in the purchase of the Canadian plant.

George W. Weber spent some time during May in Montreal in the interests of the American Can Co., and he has been in constant communication with the present proprietors of the Acme Can Works, Messrs. Jas. B. Campbell and Wm. Pratt. Should negotiations go through, the American Can Co. will spend a considerable sum of money enlarging the plant, installing new and modern machinery.

The present management will not be changed. Mr. Weber stated that if business warranted it, factories would be built in other parts of Canada, as they intend catering to the trade all over Canada.

CATALOGUES WORTH HAVING.

SWITCHBOARD PANELS—Bulletins Nos. 96 and 102 of the Canadian Crocker Wheeler Co., Ltd., Montreal, giving full information on two types of A. C. switchboard panels.

KOPPEL—A small neat booklet advertising the advantages of the town of Koppel, near Pittsburg, as a manufacturing place. Issued by the Koppel Land Co., Mchesney building, Pittsburg.

LONGEST NARROW-GAUGE RAILWAY—A reprint from "Engineering," descriptive of the longest narrow-gauge light railway in the world, which is in German South West Africa. Constructed by Messrs. Arthur Koppel, London, Eng. Apply for reprint to Arthur Koppel Co., 137 Morris building, New York.

ELECTRICAL EQUIPMENT OF CANAL—A reprint from the Electrical Review, describing the hydro-electric power development of the Chicago drainage canal, in which Crocker-Wheeler equipment is used. Apply to Canadian Crocker-Wheeler Co., Montreal.

A NEW VARIABLE SPEED MOTOR—Bulletin of the Lincoln Motor Works Co., Caxton building, Cleveland, O., illustrating and fully describing a variable speed motor of very unique design.

TOOLS FOR IMMEDIATE DELIVERY—An illustrated circular sent out by the Canadian Fairbanks Co., Montreal, showing a number of machine tools of John Bertram & Sons Co., for immediate delivery.

COVER FOR BULLETINS—Cover for bulletins the Gisholt Machine Co., Madison, Wis., send out regularly. Those wishing their name placed on this company's mailing list should write now and get cover.

FAN MOTORS—A very handsome catalogue for 1908 of fan motors, issued by the Canadian Westinghouse Co., Ltd., Hamilton.

WESTINGHOUSE BULLETINS — Four circulars, Nos. 1088, 1152, 1137, 1104, of the Canadian Westinghouse Co., Ltd., Hamilton, descriptive of three-wire, D.C. generators, poly-phase induction motors, integrating wattmeters and portable precision meters, respectively.

SKINNER CHUCKS—The 1908 price list of the Skinner Chuck Co., New Britain, Conn. It is complete and well illustrated.

ADJUSTABLE REAMERS—Catalogue and price list of the Smith one-lock adjustible reamers. Wm. J. Smith Co., New Haven, Conn.

VISES—Complete catalogue and price list of vises made by the Hollands Mfg. Co., Erie, Pa., as well as wrenches, hand pipe cutters, stocks and dies, reamers, etc.

COMBINATION PLIERS—Small catalogue and price list of the different styles of pliers made by the Crescent Tool Co., Jamestown, N.Y.

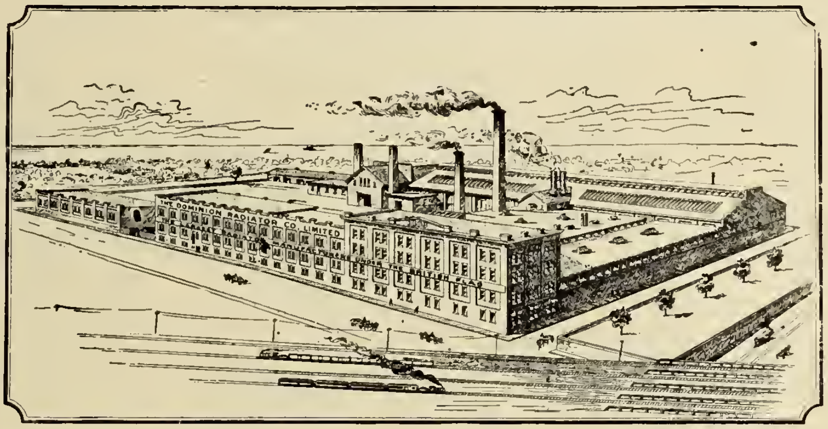
SWITCH—Pamphlet from the Hill Electric switches, spring contact knife switches, porcelain Montreal, describing the porcelain base "Beaver" baby knife switch.

SWITCH GEAR—Booklet No. 570, fully illustrated, with complete dimensions and prices, from Veritys, Ltd., 31 King St., Covent Garden, London, W.C., describing twin blade knife switches, spring contact knife switches, porcelain

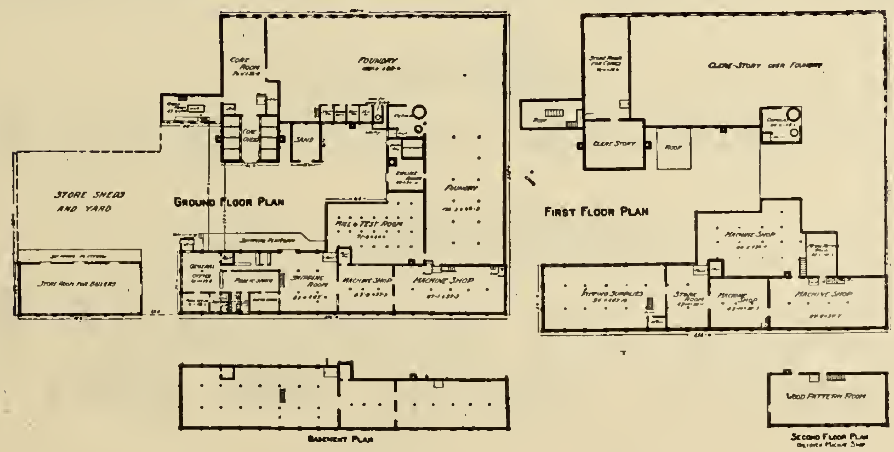
MANUFACTURER'S OPPORTUNITY

FOR SALE LAND AND BUILDINGS Foundry and Machine Shop

(Two Cupolas)



About 90,000 square feet floor space. Good yard room, close to Grand Trunk and Canadian Pacific Railways.



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THE DOMINION RADIATOR CO., LIMITED

1330 Dufferin St., Toronto, Canada

Phone P. McMichael, Park 760 or 1068

handgrip fuses, and all necessary equipment for switchboards.

ELECTRICAL HANDBOOK—A handsome gilt-edged handbook, printed on high-class paper, bound in leather, published by the British Insulated & Helsby Cables, Ltd., Prescott, Lancashire, England, received from their Canadian manager, Mr. Lawford Grant, Power building, Montreal. The first two hundred pages cover a wide range of electrical equipments manufactured by this company, including electric wire and cables, and lighting, power, telegraph and telephone equipments. The pages from 200 to 360 contain a considerable amount of general information of use to electrical engineers and men in charge of electrical plants. The book is well indexed and a reference to ..is shows that while some of the matter is already public property, and is here reprinted in a convenient form, much hitherto unpublished information is also given, making an attractive, concise and exceeding useful handbook.

BAILLOT CUPOLAS—Catalogue from J. de Clercy, 62 Ontario St., West, Montreal, describing and illustrating from Canadian illustrations the Baillot cupola.

WARREN GAS ENGINES—Two circulars of the Warren gas engine, made by Struthers-Wells Co., Warren, Pa., and sold in Canada by W. H. Oliver & Co., McKinnon building, Toronto.

THE GAVIN MACHINE CO.—Edition C., milling machine catalogue of the Gavin Machine Co., Spring and Varick streets, New York City. This is a very complete 96-page, 9x6 ins., catalogue of milling machines, well illustrated and containing all detailed information.

ROPE TRANSMISSION—The Blue Book on Rope Transmission is a booklet published by the American Manufacturing Co., 65 Wall street, New York, being a 60-page, well illustrated treatise on rope transmission. Anyone interested in rope transmission should not be without this booklet, as it is a regular text book on the subject.

ASBESTOS SUPPLIES—Illustrated catalogue of 72 pages from the Canadian Asbestos Co., Montreal, showing ir many forms of asbestos pipe covering packing in sheet and rope form, gaskets and leather-bound belting.

BOOK REVIEWS.

MACHINE DESIGN CONSTRUCTION AND DRAWING—A text book on the above subject, designed for engineering students; by Henry J. Spooner, C.E.; 691 pages, 6x9 ins.; published by Messrs. Longmans, Green & Co., 39 Paternoster Row, London, E.C. Price 10s 6d.

This is an exceptionally complete work on this subject, is profusely illustrated and contains a large number of tables. The first few chapters are taken up with lessons in how to draw, starting from elementary considerations. This feature is somewhat unusual in a text book of this character. Then are taken up in succession very detailed information and finished drawings being given in each case: Stuffing boxes, leather collars, shafting, crank shafts, cranks, journals; couplings, clutches, keys and pin keys; riveted joints; bolts, nuts, screws; pipe and pipe connections; cotters and cottered joints; pin or knuckle joints, pitch chains; bearings, journals, hangers, roller and ball bearings; toothed gearing; friction gearing; belt gearing; textile rope gearing; wire rope gearing; chains, crane hooks; steel and iron tanks; pistons and piston rods; crossheads and guides; connecting rods, engine eccentrics; machine handles; materials used in construction of machines, strength of beams; hints on designing machines and machine frames; springs.

COPPER HANDBOOK—New edition containing twenty-five chapters, an increase of nine; by Horace J. Stevens, Houghton, Mich.; 1,228 pages price $5.

The book treats of copper under the headings of History, Geology, Chemistry, Mineralogy, Mining, etc. It is so arranged that by means of the table of contents and index facts about different mines can easily be found. This makes it a handy book of reference.

The Copper Handbook is not intended to replace other books for technical men, but supplements them and every point of interest, both scientific and technical, is clearly taken up. It is the unaided work of Mr. Stevens, and contains unprejudiced descriptions of the thousands of different copper mines, plain descriptions of intricate processes of mining, milling, smelting and refining and the various commercial and financial aspects of the copper industry. The book will be found of deep interest and practical value to every man interested in the subject of copper.

GAGES AND GAGING SYSTEMS—By Joseph B. Woodworth: 250 pages, 6x9 ins.; illustrated: published by the Hill Publishing Co., 505 Pearl street, New York. Price, $2 net.

This comprehensive treatise is a valuable reference book and a work of instruction for practical men engaged in the manufacture of interchangeable parts. All obsolete methods have been eliminated and only the most modern gages and gaging systems are described. While the fundamental principles have not been overlooked and the descriptions are brief and concise as possible. The most up-to-date gages are described so that the design and construction is made clear to practical men.

The contents of the book include the development and efficiency of gages with their applications to various works. All methods are illustrated from practical experience. Various measuring machines are described, lathe, planer, surface and universal gages and indicators, thread gages, micrometer calipers, vernier gages, squares, test and sizing blocks, etc. The making and use of each is given and the work should be of great use to men interested in increasing the output of duplicate machinery and lowering the cost of production of interchangeable work.

DOMINION IRON & STEEL OUTLOOK

Charles M. Schwab, president of the Bethlehem Steel Co., Bethlehem, Pa., former president of the United States Steel Corporation, accompanied by T. J. Drummond, of Drummond & McCall, Montreal, visited St. Thomas, Hamilton, Midland, Fort William, Londonderry, Sydney and Annapolis. Prospects everywhere looked bright. It is no secret that Mr. Schwab is desirous of securing a quantity of steel stock. He expressed the opinion that the steel industry in Canada is just commencing and that the future gives promise of big things.

F. P. Jones, general manager of the Dominion Steel Co., says the production is larger than for years and there is sufficient business on hand to keep the plant running to its full est capacity. Prices are slightly lower, but the outlook is promising and encouraging.

MANUFACTURERS AND MANUFACTURERS' AGENTS.

It will pay you to watch our condensed column each month. There are many money-making propositions brought to your attention here. You may find just what you are looking for.

RATES

One insertion—25c. for 20 words; 1c. a word for each additional word.

Yearly rate—$2.50 for twenty words or less, 10c. a word for each additional word.

The above does not apply to notices under the head of "Machinery Wanted." These notices are inserted free for subscribers.

AGENCIES WANTED.

BY young man having A-1 connection with all users of power in Montreal and vicinity; 3 years with present firm. Commission basis preferred. Staple or special lines. Apply Box 91 C, CANADIAN MACHINERY, 232 McGill St., Montreal.

AGENTS WANTED.

AGENTS WANTED, well connected with Railway Directorates, for introducing a well known article referring to Sleepers of Permanent Way. Address in first instance. O. K. 3616, care Rudolf Mosse, Berlin S.W. 19, Germany. (6)

BRASS AND COPPER TUBES, SHEETS, STRIPS, etc., English manufacturers knowing Canadian market, require smart, pushing agent, who understands the trade, for Quebec and Maritime Provinces. Apply, in confidence, with full particulars, to Box 99, CANADIAN MACHINERY, 88 Fleet St., E. C., London, England. (7)

BELTING, PACKING, ETC.

BELTING, RUBBER, CANVAS AND LEATHER, Hose Packing, Blacksmith's and Mill Supplies at lowest price. N. Smith, 138 York Street, Toronto. (2tf)

MACHINERY FOR SALE.

FOR SALE—A large double geared shear, a large powerful press fitted with appliances for punching iron, two fans and other machines. National Tool and Axe Works, Three Rivers, Que. [6]

FOR SALE—One Canadian general generator, 2 phase, 75 kilowatt, complete with exciter. Has never been in use. Full information on request. Gunns Limited, West Toronto, Ont. [6]

GASOLENE ENGINE CASTINGS.

MARINE gasolene engine castings, with blue print and full instructions, etc.; 2½, 4, 6 h.p.; also complete finished outfits at $65 up; catalogue, Krug & Crosby, Hamilton. [10tf]

MACHINERY WANTED.

I HAVE a good opening for a company with a machine shop that is not rushed with work. Give full particulars of your plant, with size and number of machine tools. Address Box 52, CANADIAN MACHINERY, Toronto. (4)

WANTED—Second-hand Iron Planer, about 24 in. x 24 in. x 6 ft. Must be in fair order and a bargain for cash. Address, Harry M. Wolfenden, Box 305, Barrie, Ont. (6)

WANTED—To purchase a small alternating current motor and also a fan motor, 60 cycle, 104 to 110 volt. Address, A. E. Smith, Magog, Que. [6]

SITUATION WANTED.

SITUATION WANTED—By foreman moulder with large experience on gas and gasolene engine castings. Would like a position with firm not satisfied with cost of castings. Box 62, CANADIAN MACHINERY, Toronto. (6)

RUBBER STAMPS, ETC.

B. CAIRNS, MANUFACTURER OF RUBBER stamps, stencils, steel stamps, burning brands. 77-79 Queen Street East, Toronto, Ont.

PLANT FOR SALE.

FACTORY BUILDINGS FOR SALE.—Having moved into our new factory we will dispose of the one formerly occupied, consisting of foundry, machine and carpenter shops, with engine, boiler and line shafting, blacksmith shop, boiler shop, pattern and other storehouses. This is a splendid opportunity for parties wishing to locate in a town with exceptional advantages. Welland has cheap electric power from two companies, natural gas, water works, sewers, five railways and one electric railway, water transportation via the Welland Canal. M. Beatty & Sons, Limited, Welland, Ont. [6]

REPRESENTATION.

GENTLEMAN presently in Canada desires to represent, in Great Britain, manufacturers. Specials, Engineers' Supplies, Furnishings, etc. Address Box 61, CANADIAN MACHINERY, Toronto. (7)

MISCELLANEOUS.

HIGH CLASS COLOR WORK.—Commercial stationery, posters. The Hough Lithographing Co. Limited. Office, No. 3 Jarvis Street, Toronto. Telephone, Main 1576. Art, good workmanship, business methods. [tf]

CANADIAN MACHINERY BUYERS' DIRECTORY

To Our Readers—Use this directory when seeking to buy any machinery or power equipment. You will often get information that will save you money.
To Our Advertisers—Send in your name for insertion under the heading of the lines you make or sell.
To Non-Advertisers—A nominal rate of $1 per line a year is charged non-advertisers.

Abrasive Materials.

The Canadian Fairbanks Co., Montreal.
Canadian Hart Wheels Ltd., Hamilton.
Rice Lewis & Son, Toronto.
Norton Co., Worcester, Mass.
H. W. Petrie, Toronto.
Carborundum Co., Niagara Falls, N.Y.
Williams & Wilson, Montreal.

Air Receivers.

Allis-Chalmers-Bullock Montreal.
Canada Foundry Co., Toronto.
Canadian Rand Co., Montreal.
John McDougall Caledonian Iron Works Co., Montreal.

Alloys.

Goldschmidt Thermit Co., Toronto.

Arbors.

Cleveland Twist Drill Co., Cleveland
National Twist Drill & Tool Co., Detroit
Owen Machine Tool Co., Springfield, Ohio

Arbor Presses.

Niles-Bement-Pond Co., New York.

Automatic Machinery.

National-Acme Mfg. Co., Cleveland

Automobile Parts

Globe Machine & Stamping Co., Cleveland, Ohio.

Axle Cutters.

Butterfield & Co., Rock Island, Que.
A. B. Jardine & Co., Hespeler, Ont.

Babbit Metal.

Canada Metal Co., Toronto.
Canada Machinery Agency, Montreal.
Lumen Bearing Co., Toronto.
Rice Lewis & Son, Toronto.
Syracuse Smelting Works, Montreal
Tallman, J. N., & Sons, Hamilton

Barrels, Steel Shop.

Cleveland Wire Spring Co., Cleveland.

Barrels, Tumbling.

Detroit Foundry Supply Co., Windsor
Dominion Foundry Supply Co., Montreal
Hamilton Facing Mill Co., Hamilton.
Hyde, Francis & Co., Montreal
Globe Machine & Stamping Co., Cleveland, Ohio.
Northern Engineering Works, Detroit.
H. W. Petrie, Toronto.
Sly, W. W., Mfg. Co., Cleveland
Smith, J. D., Foundry Supply Co., Cleveland, Ohio
The Smart-Turner Mach. Co., Hamilton.
Whiting Foundry Equipment Co., Harvey, Ill.

Bars, Boring.

Hall Engineering Works, Montreal.
Niles-Bement-Pond Co., New York.

Bearings, Self-Oiling.

Wilson, J. C., & Co., Glenora, Ont.

Belting, Chain.

Canada Machinery Exchange, Montreal.
Jeffrey Mfg. Co., Columbia, Ohio.
Waterous Engine Works Co., Brantford.

Belting, Cotton.

Canada Machinery Agency, Montreal.
Dominion Belting Co., Hamilton.
Rice Lewis & Son, Toronto.

Belt Dressing.

Stephenson Mfg. Co., Albany, N.Y.

Belting, Leather.

Canada Machinery Agency, Montreal.
The Canadian Fairbanks Co., Montreal.
McLaren, J. C., Montreal.
Rice Lewis & Son, Toronto.
H. W. Petrie, Toronto.
Sadler & Haworth, Montreal
Williams & Wilson, Montreal.

Bending Machinery.

John Bertram & Sons Co., Dundas, Ont.
Bliss, E. W., Co., Brooklyn, N.Y.
Ferracute Machine Co., Bridgeton, N.J.
Jardine, A. B. & Co., Hespeler, Ont.
Rice Lewis & Son, Toronto.
London Mach. Tool Co., Hamilton, Ont.
National Machinery Co., Tiffin, Ohio.
Niles-Bement-Pond Co., New York.

Blowers.

Canada Machinery Agency, Montreal.
Detroit Foundry Supply Co., Windsor
Dominion Foundry Supply Co., Toronto
Hamilton Facing Mill Co., Hamilton
Hyde, Francis & Co., Montreal
Kerr Turbine Co., Wellsville, N.Y.
Sheldon's Limited, Galt.
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Blast Gauges—Cupola.

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Owen Sound Iron Works Co., Owen Sound.
H. W. Petrie, Toronto.
Robb Engineering Co., Amherst, N.S.
The Smart-Turner Mach. Co., Hamilton.
Waterous Engine Works Co., Brantford.
Williams & Wilson, Montreal.

Boiler Compounds.

Canada Chemical Mfg. Co., London, Ont.
Hall Engineering Works, Montreal.

Boiler Makers' Supplies.

Allen, John F. New York

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John Bertram & Sons Co., Dundas, Ont.
Canada Machinery Agency, Montreal.
Rice Lewis & Son, Toronto.
London Mach. Tool Co., Hamilton.
National Machinery Co., Tiffin, Ohio.
Niles-Bement-Pond Co. New York.
Waterbury Farrell Foundry & Machine Co., Waterbury, Conn.

Boring Machines, Upright.

American Tool Works Co., Cincinnati.
John Bertram & Sons Co., Dundas, Ont.
London Mach. Tool Co., Hamilton.
Niles-Bement-Pond Co., New York.

Boring Machine, Wood.

Independent Pneumatic Tool Co., Chicago, Ill.
London Mach. Tool Co., Hamilton.

Boring and Turning Mills.

American Tool Works Co., Cincinnati.
John Bertram & Sons Co., Dundas, Ont.
Canada Machinery Agency, Montreal.
Gisholt Machine Co., Madison, Wis.
Rice Lewis & Son, Toronto.
London Mach. Tool Co., Hamilton.
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.

Box Puller.

A. B. Jardine & Co., Hespeler, Ont.

Boxes, Steel Shop.

Cleveland Wire Spring Co., Cleveland.

Boxes, Tote.

Cleveland Wire Spring Co., Cleveland.

Brass Working Machinery.

Warner & Swasey Co., Cleveland, Ohio.

Brushes, Foundry and Core.

Detroit Foundry Supply Co., Windsor.
Dominion Foundry Supply Co., Toronto
Hamilton Facing Mill Co., Hamilton.
Hyde, Francis & Co., Montreal
Smith, J. D., Foundry Supply Co., Cleveland, Ohio

Buckets, Clam Shell.

Jeffrey Mfg. Co., Columbus, Ohio
Whiting Foundry Equipment Co., Harvey, Ill.

Buckets, Crab.

Jeffrey Mfg. Co., Columbus, Ohio

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Lewis, Rice, & Son, Toronto
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National Machinery Co., Tiffin, Ohio.
Niles-Bement-Pond Co., New York.

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Bullivant & Co., London Eng.
Phillips, Eugene F., Electrical Works, Montreal

Canners' Machinery.

Bliss, E. W., Co., Brooklyn, N.Y.
Brown, Boggs Co. Hamilton
Ferracute Machine Co., Bridgeton, N.J.
Jeffrey Mfg., Columbus, Ohio
Wilson, J. C., & Co., Glenora, Ont.

Cars, Dryer.

Hammant Steel Car & Engineering Works, Hamilton, Ont.

Cars, Factory & Warehouse.

Hammant Steel Car & Engineering Works, Hamilton Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

Cars, Foundry.

Detroit Foundry Supply Co., Windsor
Dominion Foundry Supply Co., Montreal
Hamilton Facing Mill Co., Hamilton.
Hammant Steel Car & Engineering Works, Hamilton Ont.
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Lumen Bearing Co., Toronto
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Castings, Brass.

Chadwick Bros., Hamilton.
Hall Engineering Works, Montreal.
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Niagara Falls Machine & Foundry Co. Niagara Falls, Ont.
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John McDougall Caledonian Iron Works Co., Montreal.
Niagara Falls Machine & Foundry Co., Niagara Falls. Ont
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Reid Foundry & Mach. Co., Ingersoll, Ont
Robb Engineering Co., Amherst, N.S.
Smart-Turner Machine Co., Hamilton.
Stevens Co., Galt, Ont
Wilson, J. C., & Co., Glenora, Ont.

Castings, Phosphor Bronze.

Lumen Bearing Co., Toronto

Castings, Semi-Steel.

Reid Foundry & Mach. Co., Ingersoll, Ont.
Robb Engineering Co., Amherst. N.S.

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Canada Chemical Co., London.

Chrome Brick.

Harbison - Walker Refractories Co., Pittsburg

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American Tool Works Co., Cincinnati.
John Bertram & Sons Co., Dundas, Ont.
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Cleveland Twist Drill Co., Cleveland
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Jacobs Mfg. Co., Hartford, Conn
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London Mach. Tool Co., Hamilton.
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Collectors, Pneumatic.

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Allis-Chalmers-Bullock, Limited, Montreal
Canada Foundry Co., Limited, Toronto.
Canada Machinery Agency, Montreal.
Canadian Rand Co., Montreal.
Canadian Westinghouse Co., Hamilton.
Darling Bros., Ltd., Montreal
Gas & Electric Power Co., Toronto.
John McDougall, Caledonian Iron Works Co., Montreal
The Smart-Turner Mach. Co., Hamilton.
Hall Engineering Works, Montreal, Que.
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.
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Concentrating Plant.

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Canada Foundry Co., Limited, Toronto.
Canada Machinery Agency, Montreal.
Goldie & McCulloch Co., Galt
Hall Engineering Works Montreal.
Smart-Turner Machine Co., Hamilton.
Waterous Engine Co., Brantford.

Consulting Engineers.

Connor, A. W., Toronto
Fensom, C. J., Toronto
Hall Engineering Works, Montreal.
Jules De Clercy, Montreal.
Roderick J. Parke, Toronto.
T. Pringle & Son, Montreal.
Somerville, T. A., Hamilton
Stewart & McTaggart, Hamilton
Taylor, James, Wine Harbor, N.S.

Contractors' Plant.

Allis-Chalmers-Bullock, Montreal.
John McDougall, Caledonian Iron Works Co., Montreal.
Niagara Falls Machine & Foundry Co., Niagara Falls, Ont.

Controllers and Starters Electric Motor.

Allis-Chalmers-Bullock, Montreal.
Canadian General Electric Co., Toronto.
Canadian Westinghouse Co., Hamilton.
Gas & Electric Power Co, Toronto.
T. & H. Electric Co., Hamilton.

Converters, Steel.

Northern Engineering Works, Detroit.
Whiting Foundry Equipment Co., Harvey, Ill.

Conveyor Machinery.

Goldie & McCulloch Co., Galt
Jeffrey Mfg. Co., Columbus, Ohio.
Laurie Engine & Machine Co., Montreal.
Rice Lewis & Son, Toronto.
John McDougall Caledonian Iron Works Co., Montreal.
Smart-Turner Machine Co., Hamilton.
Waterous Engine Works Co., Brantford.
Williams & Wilson, Montreal.
Wilson, J. C., & Co., Glenora, Ont

Conveyors, Chain.

Jeffrey Mfg. Co., Columbus, Ohio

Coping Machines.

John Bertram & Sons Co., Dundas, Ont.
London Mach. Tool Co., Hamilton.
Niles-Bement-Pond Co., New York.

Corundum and Corundum Wheels.

Canadian Hart Wheels Ltd., Hamilton

Core Compounds.

Buffalo Foundry Supply Co., Buffalo.
Detroit Foundry Supply Co., Windsor.
Dominion Foundry Supply Co., Toronto
Hamilton Facing Mill Co., Hamilton.
Hyde, Francis & Co. Montreal
Smith, J. D., Foundry Supply Co, Cleveland, Ohio.

Core Machines.

Hyde Francis & Co., Montreal
Smith, J. D, Foundry Supply Co., Cleveland, Ohio

Core Ovens.

Detroit Foundry Supply Co., Windsor.
Dominion Foundry Supply Co., Montreal
Hamilton Facing Mill Co., Hamilton.
Hyde, Francis & Co., Montreal
Sheldons Limited, Galt
Whiting Foundry Equipment Co., Harvey, Ill.

Core Sand Cleaners.

Sly, W. W., Mfg. Co., Cleveland

Counterbores.

Cleveland Twist Drill Co., Cleveland
National Twist Drill & Tool Co, Detroit

Couplings.

Owen Sound Iron Works Co, Owen Sound
Wilson, J. C., & Co., Glenora Ont.

Couplings, Air.

Canadian Rand Co., Montreal.
Independent Pneumatic Tool Co., Chicago

Cranes, Electric and Hand Power.

Canada Foundry Co., Limited, Toronto
Canadian Pilling Co, Montreal
Canadian Rand Co., Montreal.
Cleveland Crane & Car Co., Wickliffe, Ohio.
Dominion Foundry Supply Co., Montreal
Gas & Electric Power Co oronto
Hamilton Facing Mill Co., Hamilton.
John McDougall, Caledonian Iron Works Co., Montreal.
Niles-Bement-Pond Co., New York.
Northern Engineering Works, Detroit
Owen Sound Iron Works Co, Owen Sound
Smart-Turner-Machine Co., Hamilton.
Smith, J. D., Foundry Supply Co., Cleveland, Ohio.
Whiting Foundry Equipment Co., Harvey, Ill.

Crank Pins.

Sight Feed Oil Pump Co., Milwaukee, Wis.

Crankshafts.

St. Clair Bros., Galt

Crank Pin Turning Machine

London Mach. Tool Co., Hamilton.
Niles-Bement-Pond Co., New York.

Cross Head Pins.

Sight Feed Oil Pump Co., Milwaukee, Wis.

Crucibles.

Detroit Foundry Supply Co., Windsor
Dominion Foundry Supply Co., Montreal
Goldschmidt Thermit Co., Toronto
Hamilton Facing Mill Co., Hamilton.
Hyde Francis & Co., Montreal
Siedel, R. B., Inc. Philadelphia
Smith, J. D, Foundry Supply Co., Cleveland, Ohio.

Crushers, Rock or Ore.

Allis-Chalmers-Bullock, Montreal.
Jeffrey Mfg. Co., Columbus, Ohio.

Cupolas.

Byram & Co., Detroit
Detroit Foundry Supply Co., Windsor
Dominion Foundry Supply Co., Montreal
De Clercy, J., Montreal
Hamilton Facing Mill Co., Hamilton.
Hyde, Francis & Co., Montreal
Northern Engineering Works, Detroit
Sheldons Limited, Galt.
Smith, J. D., Foundry Supply Co., Cleveland, Ohio.
Whiting Foundry Equipment Co. Harvey, Ill.

Cupola Blast Gauges.

Dominion Foundry Supply Co., Montreal
Sheldons Limited, Galt

Cupola Blocks.

Detroit Foundry Supply Co., Detroit.
Dominion Foundry Supply Co., Toronto
Hamilton Facing Mill Co., Hamilton
Hyde, Francis & Co., Montreal
Northern Engineering Works, Detroit
Ontario Lime Association, Toronto

Cupola Blowers.

Canada Machinery Agency, Montreal.
Detroit Foundry Supply Co., Windsor
Dominion Foundry Supply Co, Toronto
Hamilton Facing Mill Co., Hamilton.
Hyde, Francis & Co., Montreal
Northern Engineering Works, Detroit
Sheldon's Limited, Galt.

Cupola Linings.

Maurer, Henry, & Son, New York.

Cutters, Flue

Independent Pneumatic Tool Co., Chicago Ill.

Cutter Grinder Attachment.

Cincinnati Milling Machine Co., Cincinnati

Cutter Grinders.

Cincinnati Milling Machine Co., Cincinnati

Cutters, Milling.

Abbott, Wm, Montreal
Becker, Brainard Milling Machine Co. Hyde Park, Mass.
Cleveland Twist Drill Co., Cleveland
Hamilton Tool Co., Hamilton, Ont.
National Twist Drill & Tool Co., Detroit
Owen Machine Tool Co, Springfield, Mass.
Pratt & Whitney Co., Hartford, Conn.
Standard Tool Co., Cleveland.

Cutting-off Machines.

Armstrong Bros., Tool Co., Chicago
John Bertram & Sons Co., Dundas, Ont.
Burke Machinery Co, Cleveland, Ohio
Canada Machinery Agency, Montreal.
Rice Lewis & Son, Toronto.
London Mach. Tool Co., Hamilton.
H. W. Petrie, Toronto.
Pratt & Whitney Co., Hartford, Conn.

Cutting-off Tools.

Armstrong Bros. Tool Co., Chicago.
London Mach. Tool Co., Hamilton.
H. W. Petrie, Toronto.
Pratt & Whitney, Hartford, Conn.
Rice Lewis & Son, Toronto.
L. S. Starrett Co., Athol, Mass.

Damper Regulators.

Darling Bros., Ltd., Montreal

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Armstrong Bros., Toronto
Banfield, W. H. & Son, Toronto
Bliss, E. W., Co., Brooklyn, N.Y.
Brown, Boggs Co., Hamilton
Ferracute Machine Co., Bridgeton, N.J.
Cleal, Joseph P., Toronto.
Globe Machine & Stamping Co., Cleveland, Ohio.
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Stevens Co., Galt, Ont.

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Dies, Opening

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Jardine, A. B. & Co., Hespeler, Ont.
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H. W. Petrie, Toronto.
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London Mach. Tool Co., Hamilton.
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Hamilton Tool Co., Hamilton, Ont.
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London Mach. Tool Co., Hamilton.

Drilling Machines, Horizontal.

John Bertram & Sons Co., Dundas, Ont.
Canada Machinery Agency, Montreal.
Lewis, Rice & Son, Toronto.
London Mach. Tool Co., Hamilton.
Niles-Bement-Pond Co., New York.

Drills, Bench.

Hamilton Tool Co, Hamilton, Ont.
Lewis, Rice & Son, Toronto.
London Mach. Tool Co., Hamilton.
Pratt & Whitney Co., Hartford, Conn.

Drills, Blacksmith.

Canada Machinery Agency, Montreal.
A. B. Jardine & Co., Hespeler, Ont.
London Mach. Tool Co., Hamilton.
National Twist Drill & Tool Co., Detroit
Standard Tool Co., Cleveland.

Drills, Centre.

Cleveland Twist Drill Co., Cleveland
Lewis, Rice & Son, Toronto.
National Twist Drill & Tool Co., Detroit
Pratt & Whitney Co., Hartford, Conn.
Standard Tool Co., Cleveland, O.
L. S. Starrett Co., Athol, Mass.

Drills, Coal and Plaster.

Cumming, J. W., New Glasgow, N.S.

Drills, Electric

Canadian Pilling Co., Montreal
Gas & Electric Power Co., Toronto.
Niles-Bement-Pond Co., New York.

Drills, High Speed.

Abbott, Wm., Montreal
Cleveland Twist Drill Co, Cleveland

Alexander Gibb, Montreal.
Lewis, Rice & Son, Toronto.
Lincoln-Williams Twist Drill Co, Taunton, Mass.
National Twist Drill & Tool Co, Detroit
Pratt & Whitney Co., Hartford, Conn.
Richardson, John L. & Co., Toronto
Standard Tool Co., Cleveland, O.

Drills, Hand.

A. B. Jardine & Co., Hespeler, Ont.

Drills, Pneumatic.

Allen, John F., New York
Canada Machinery Agency, Montreal.
Canadian Rand Co., Montreal
Independent Pneumatic Tool Co., Chicago, New York
Niles-Bement-Pond Co., New York.

Drills, Ratchet.

Armstrong Bros. Tool Co, Chicago.
Cleveland Twist Drill Co., Cleveland
A. B. Jardine & Co., Hespeler,
National Twist Drill & Tool Co, Detroit
Pratt & Whitney Co., Hartford, Conn.
Standard Tool Co., Cleveland.

Drills, Rock.

Allis-Chalmers-Bullock, Montreal.
Canadian Rand Drill Co., Montreal.
Jeffrey Mfg Co., Columbus, Ohio.

Drills, Sensitive.

American Tool Works Co., Cincinnati.
Canada Machinery Agency, Montreal.
Dwight Slate Machine Co., Hartford.
Lewis, Rice & Son, Toronto.
McKenzie, D., Guelph, Ont.
Niles-Bement-Pond Co., New York

Drills, Twist.

Cleveland Twist Drill Co., Cleveland
Alex. Gibb, Montreal.
Lincoln-Williams Twist Drill Co., Taunton, Mass.
Morse Twist Drill and Machine Co., New Bedford, Mass.
National Twist Drill & Tool Co, Detroit
Pratt & Whitney Co., Hartford, Conn.
Standard Tool Co., Cleveland.
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Dry Kiln Equipment.

Sheldons Limited, Galt

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Jeffrey Mfg. Co., Columbus, Ohio
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Niles-Bement-Pond Co., New York.
Owen Sound Iron Works Co., Owen Sound
Standard Bearings, Ltd., Niagara Falls.
Waterous Engine Co., Brantford.

Duplicate Machinery.

Hall, J. H., & Sons, Brantford
Scott Machine Co., London.

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Sly, W. W., Mfg. Co., Cleveland

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Allis-Chalmers-Bullock, Montreal.
Canadian General Electric Co., Toronto.
Canadian Westinghouse Co., Hamilton.
Gas & Electric Power Co., Toronto
Hall Engineering Works, Montreal, Que.
Lewis, Rice & Son, Toronto.
John Millen & Son, Ltd., Montreal.
Packard Electric Co., St. Catharines.
H. W. Petrie, Toronto.
T. & H. Electric Co., Hamilton.

Dynamos—Turbine Driven.

Gas & Electric Power Co., Toronto.
Kerr-Turbine Co., Wellsville, N.Y.

Electrical Pyrometers.

Thwing, O. B., Philadelphia

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Canadian Westinghouse Co., Hamilton.
Gas & Electric Power Co, Toronto
London Mach. Tool Co., Hamilton, Ont.
Packard Electric Co., St. Catharines.
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Hyde, Francis & Co., Montreal

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McKenzie, D., Guelph, Ont.

Emery Wheel Dressers.

Canadian Hart Wheels Ltd., Hamilton.
Canada Machinery Agency, Montreal.
Dominion Foundry Supply Co., Montreal
Hamilton Facing Mill Co., Hamiltcn.
Hyde, Francis & Co., Montrea
John Millen & Son, Ltd, Montreal.
H. W. Petrie, Toronto.
Standard Tool Co., Cleveland.

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Darling Bros., Ltd., Montreal
Gas & Electric Power Co., Toronto
Goldie & McCulloch Co., Galt, Ont.
Hall Engineering Works, Montreal,
Laurie Engine & Machine Co., Montreal.
John McDougall, Caledonian Iron Works Co., Montreal.
Robb Engineering Co, Amherst, N S.
The Smart-Turner Mach. Co., Hamilton.

Engineers' Supplies.

Hall Engineering Works, Montreal.
Rice Lewis & Son, Toronto.

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Canada Machinery Agency, Montreal.
The Canadian Fairbanks Co., Montreal.
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Gilson Mfg. Co., Guelph
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The Smart-Turner Mach. Co., Hamilton

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Dinning & Eckinstein, Montreal.
Jones & Glassco, Montreal

Engines, Steam.

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Belliss & Marcom, Birmingham, Eng.
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Rice Lewis & Son, Toronto.
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Gas & Electric Power Co. Toronto
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Forgings, Drop.

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Foundry Parting.

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Dominion Foundry Supply Co., Toronto
Foundry Specialty Co, Cincinnati.
Hyde, Francis & Co., Montreal
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Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.
Pratt & Whitney Co., Hartford. Conn.
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Williams & Wilson, Montreal.
Wilson, J. C., & Co, Glenora, Ont.

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Laurie Engine & Machine Co., Montreal.
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Waterous Engine Co., Brantford.
Wilson, J. C., & Co., Glenora, Ont.

Gears, Cut.

Boston Gear Works, Norfolk Downs, Mass
Goldie & McCulloch Co., Galt, Ont.
Gould & Eberhardt, Newark, N.J.
Horsburgh & Scott Co., Cleveland
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Wilson, J. C., & Co., Glenora, Ont.

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Canadian Hart Wheels Ltd., Hamilton.
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Lewis, Rice & Son, Toronto

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Canadian Hart Wheels Ltd., Hamilton.
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H. W. Petrie, Toronto.
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Hall, J. H., & Sons, Brantford.

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Hammers, Drop.

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Whitman & Barnes Mfg. Co., St Catharines, Ont.

Hammers, Steam.

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Hoists, Pneumatic.

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Dominion Foundry Supply Co., Montreal
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Northern Engineering Works, Detroit
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Hoists, Portable & Stationary.

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Hose, Air.

Canadian Rand Co., Montreal.
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Hose, Steam.

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Wilson, J. C., & Co., Glenora, Ont.

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Owen Machine Tool Co., Springfield, Ohio.
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Owen Machine Tool Co, Springfield, Ohio.
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The Canadian Fairbanks Co., Montreal.
Cincinnati Milling Machine Co., Cincinnati
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
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London Mach. Tool Co., Hamilton, Ont.
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Cincinnati Milling Machine Co., Cincinnati
Kearney & Trecker Co., Milwaukee, Wis.
Kempsmith Mfg. Co., Milwaukee, Wis.
Lewis, Rice & Son, Toronto,
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Owen Machine Tool Co., Springfield, Ohio.
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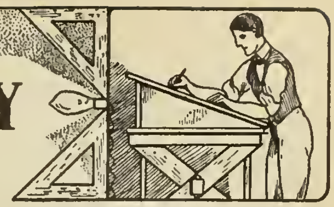

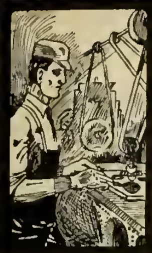

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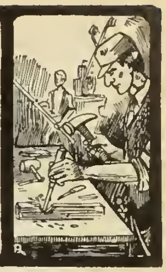

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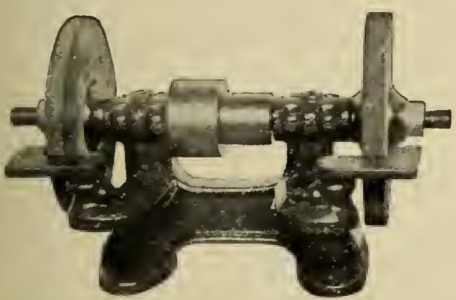

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Northern Engineering Works, Detroit
Whiting Foundry Equipment Co., Harvey, Ill.

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London Mach. Tool Co., Hamilton, Ont.
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Stevens Co., Galt, Ont.

Vises, Drill.

Stevens Co., Galt Ont.

Vises Milling Machines.

Stevens Co., Galt, Ont.

Vises, Planer and Shaper.

American Tool Works Co., Cincinnati, O.
Niles-Bement-Pond Co., New York.

Washer Machines.

National Machinery Co., Tiffin, Ohio.

Water Wheels.

Allis-Chalmers-Bullock Co., Montreal.
Canada Machinery Agency, Montreal.
John McDougall Caledonian Iron Works Co., Ltd., Montreal
Wilson, J. C., & Co. Glenora, Ont.

Water Wheels, Turbine.

Wilson, J. C., & Co., Glenora, Ont.

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Goldschmidt Thermit Co., Montreal

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Detroit Foundry Supply Co., Windsor.
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B. Greening Wire Co., Hamilton, Ont

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The B. Greening Wire Co., Hamilton.

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Wire, Railway Feeder and Trolley.

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Johnson, C. H., & Sons, St. Henri, Montreal.

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Independent Pneumatic Tool Co., Chicago, Ill.

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Waterous Engine Works Co., Brantford
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"FOUNDRYMEN OF CANADA"

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Witness our MODERN METHOD of melting BRASS FOUNDRY Metals, FERRO ALLOYS and adaptable for reducing Gold and Silver Ores, Nickle, etc.

The MINING Interests of "NIPISSING" and "COBALT" especially invited.

Furnaces operated with Fuel Oil and Air.

"STEELE-HARVEY" Crucible Tilting Melting Furnace

This furnace does the work of

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Close down the foundry and bring the "BOYS" along.

Leave your cards in our "ORDER BASKET" and ask for **"Founders' Friend"**

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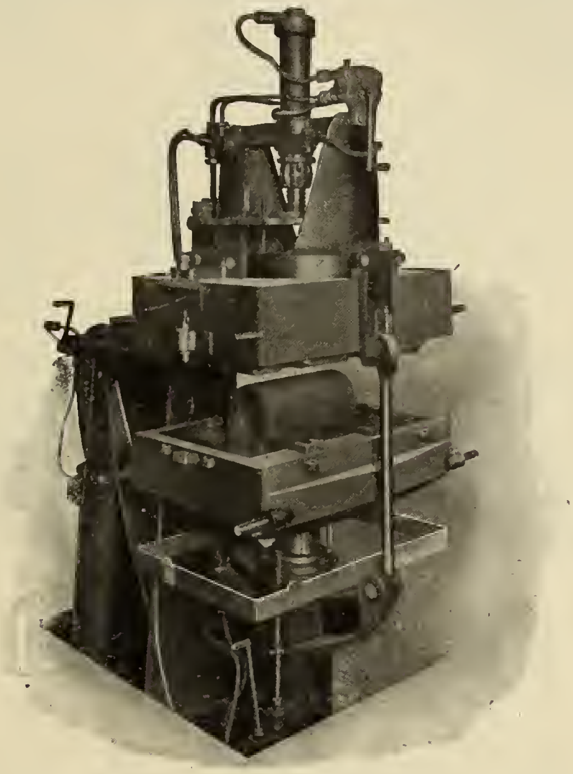
TRADE
SMOOTH-ON
MARK.
REG.U.S.PAT.OFF.
FOR
FOUNDRYMEN

See our adv. on page 107

Concerning Power Roll-Over Molding Machines— Why not do ALL of the Work by POWER?

The LEAST of the things that this Machine does is to ROLL OVER BY POWER



It Rams, Clamps, Rolls Over and Draws Patterns by Power— All in a fraction of a Minute

R-3 Roll-Over Machine for Molds of any size and shape up to 22" x 32"—Also longer than 32"—12" Pattern Draft

HYDRAULIC STRIPPING PLATE MACHINES AND PATTERN PROCESSES OF BONVILLAIN & RONCERAY

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SHELTON
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LOSS

REPORT OF A.F.A. CONVENTION

CANADIAN MACHINERY AND MANUFACTURING NEWS

A monthly newspaper devoted to the manufacturing interests, covering in a practical manner the mechanical, power, foundry and allied fields. Published by The MacLean Publishing Company, Limited, Toronto, Montreal, Winnipeg, and London, Eng.

MONTREAL, 232 McGill Street. TORONTO, 10 Front Street East. WINNIPEG, 511 Union Bank Building. LONDON, ENG., 88 Fleet Street, E.C

Vol. IV. Publication Office : Toronto, July, 1908. No. 6

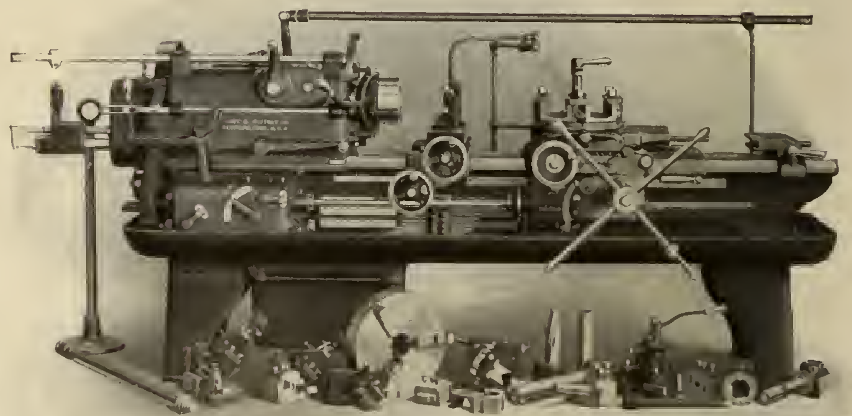
OPEN TURRET LATHE WITH CROSS SLIDING TURRET

Equally suitable for work on Bars, Castings and Forgings.

¶ The **open** Turret gives tools a **solid backing** as well as a solid seat.

¶ 30% heavier than any turret lathe of its size.

¶ Drive—single pulley or direct connected motor mounted on stationary head stock which is bolted solid to the bed. The most powerful drive of all turret lathes of its size.



3705

2½ x 26 Open Turret Lathe with Cross Sliding Turret

¶ Sixteen changes of speed through steel gears while running.

¶ Turret is mounted on cross-slide on carriage with a broad base and a narrow guide.

¶ Lock bolt is **horizontal,** is hardened and ground, and is directly under the cutting tool. No tendency to lift turret from its seat.

3798

A Few Samples of Chucked Work

Write to nearest office for complete illustrated Catalogue—"The Open Turret Lathe."

Pratt & Whitney Company

HARTFORD, CONN., U.S.A.

SALES AGENTS—THE CANADIAN FAIRBANKS COMPANY, LIMITED

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ALTERNATING CURRENT

MOTOR

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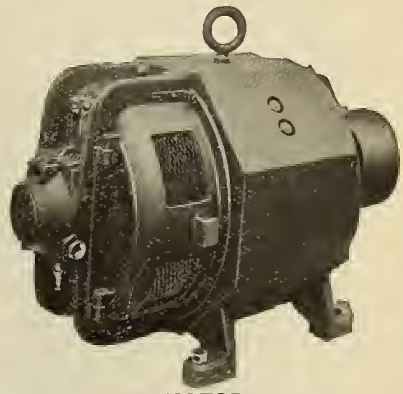


MOTOR

Less {Repairs / Attention / Cost of Running}

High Efficiency
Low Price

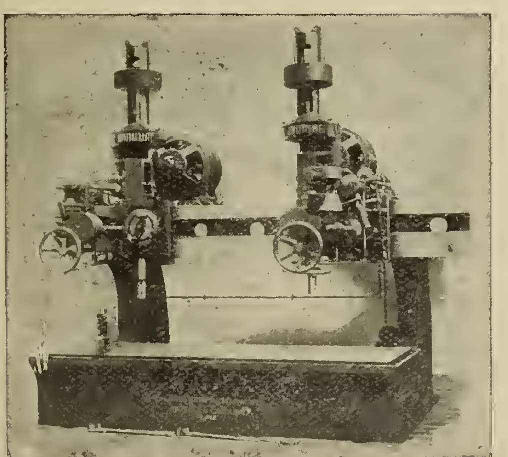
OBTAIN PRICES FROM

GAS AND ELECTRIC POWER CO.

SUPPLIERS OF ALL KINDS OF
HIGH-GRADE ELECTRICAL APPARATUS.

123 Bay Street, TORONTO

Westinghouse
Individual Motor-Drive



Westinghouse Motors
Driving Bertram Two-Spindle Drilling Machine

Extensions To Plants

are constantly being planned. It is a simple proposition of floor space and machines, when individual motor drive is used. No line-shaft or belting to bother with, just a wire.

Canadian Westinghouse Co., Limited

General Office and Works, HAMILTON, ONT.
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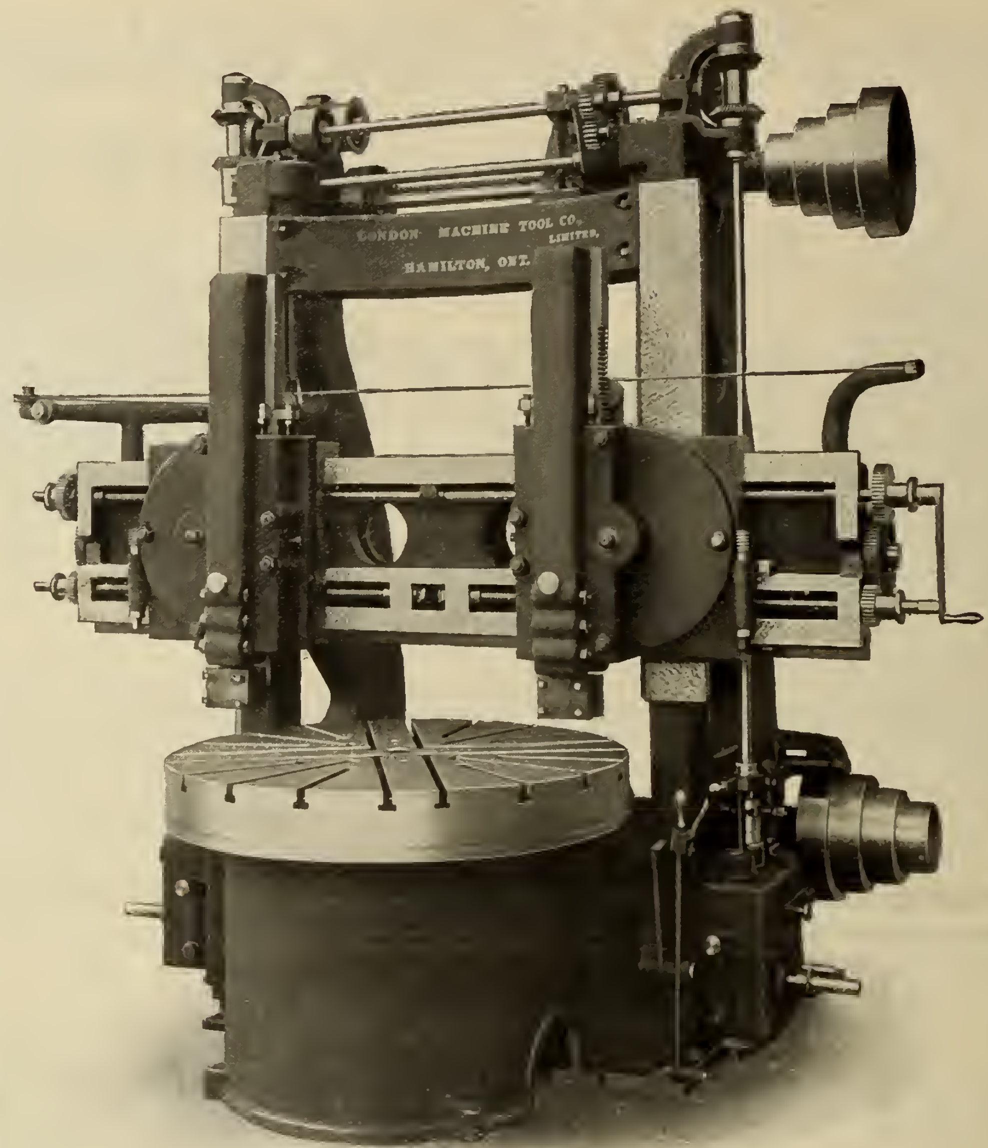
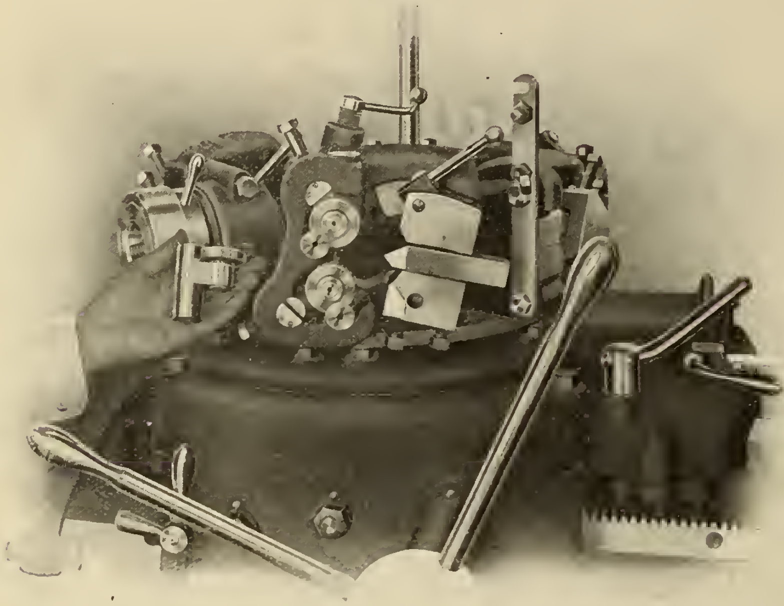

LONDON MACHINE TOOL CO. LIMITED
HAMILTON, ONT.

Cost Reducing With The Hartness Flat Turret Lathe



ROLLER TURNER FOR HIGH-SPEED TURNING

It has two independent adjustments for turning two sizes.

It may be quickly opened to pass over a large diameter and instantly closed to either of the two sizes for which it has been set.

The rolls may be set to precede or follow the cutter.

Its rolls run on straight headless pins hardened and ground. These pins are held by a rocker insuring an axis, in parallelism with work.

All adjustments are conveniently made and are the most direct and unyielding in resistance of working strains.

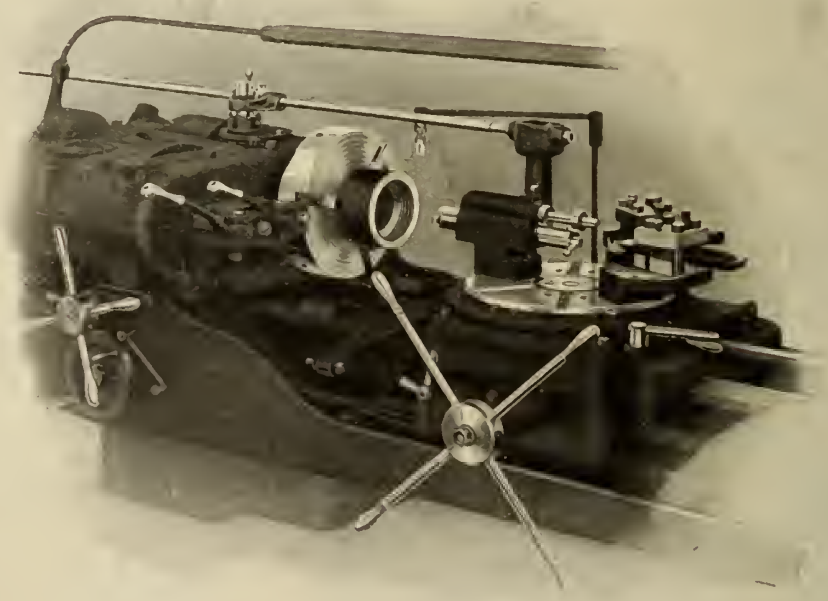
The Cross Feeding Head Flat Turret Lathe is now built in two sizes: 2 x 24,--- 12 inch swing, and 3 x 36,---14 inch swing.

AUTOMATIC SCREW CHASING TOOL

This cut shows the chasing tool in working position (some of the other tools have been removed to give a fuller view).

It cuts screws of any diameter from 1 1½ down to 2¼ inches in diameter for internal screws and about 1 inch for external threads, and any length under 4 inches.

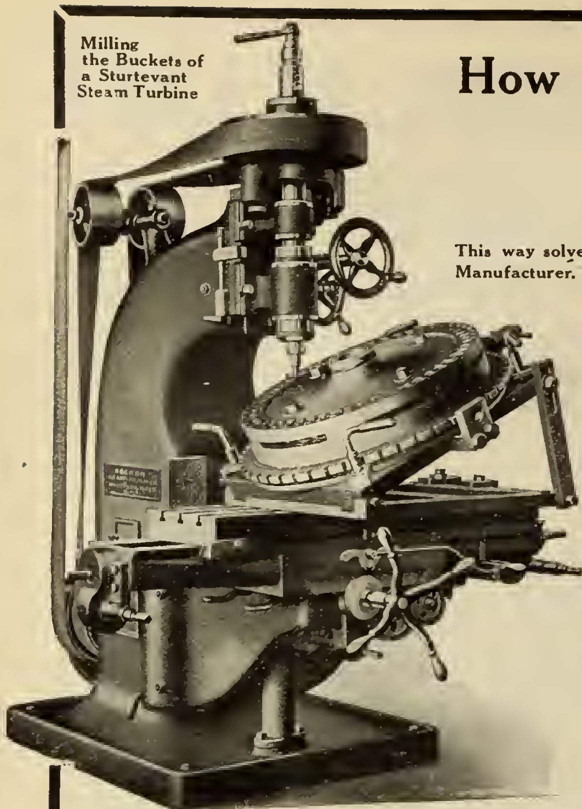
The great advantage of this attachment is in its producing a screw thread which is known to be absolutely true with the other cuts that have been taken at the same setting, and notwithstanding its rapid operation its accuracy exceeds the product of the average engine lathe.



Jones & Lamson Machine Co.

SPRINGFIELD, VERMONT, U.S.A.

Milling the Buckets of a Sturtevant Steam Turbine



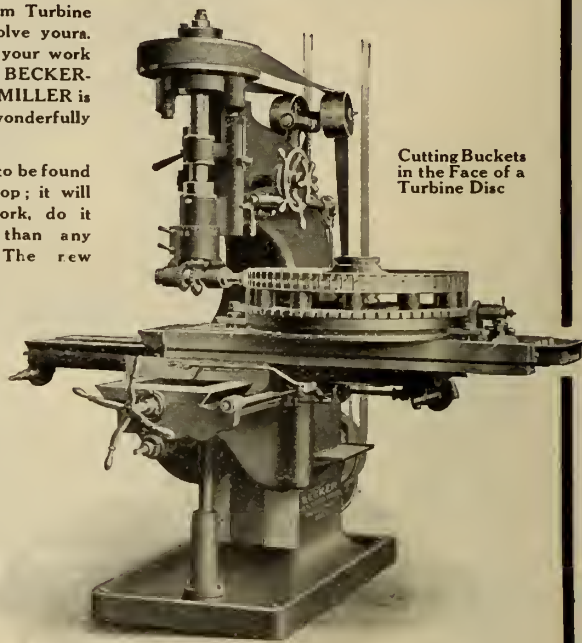
How else could you do this work ?

There's only one way to do it and that is on a

VERTICAL MILLER

This way solved the problem for the Steam Turbine Manufacturer. Some other way would solve yours. Send us details regarding your work and let us show you. The BECKER-BRAINARD VERTICAL MILLER is equal to anything ; it's a wonderfully versatile tool.

It's the most adaptable tool to be found in the modern machine shop ; it will do a larger variety of work, do it better and do it quicker than any other single machine. The new horizontal attachment adds to the essential features of the horizontal type, including the cutting of spirals. The permanency of alignment of the vertical spindle, the staunch design, the great depth of throat, the convenience of operation, all combine to make it an ndispensable tool.

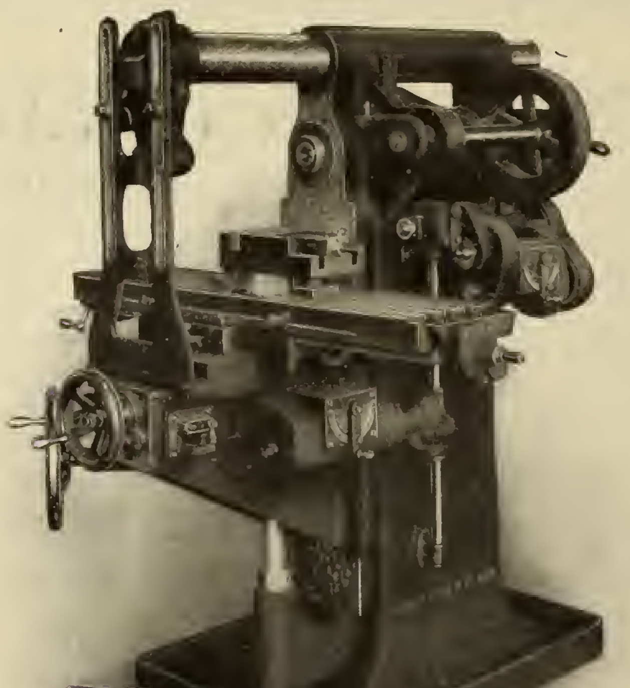


Cutting Buckets in the Face of a Turbine Disc

Becker-Brainard Milling Machine Co.

Hyde Park, Mass., U.S.A.

Agents—A. R. Williams Mchy. Co. Toronto, Williams & Wilson, Montreal.



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No. 2-B PLAIN

A model of Simplicity, Rigidity and Accuracy.

A modern tool throughout. If you haven't one, better get in line ; you will never regret it.

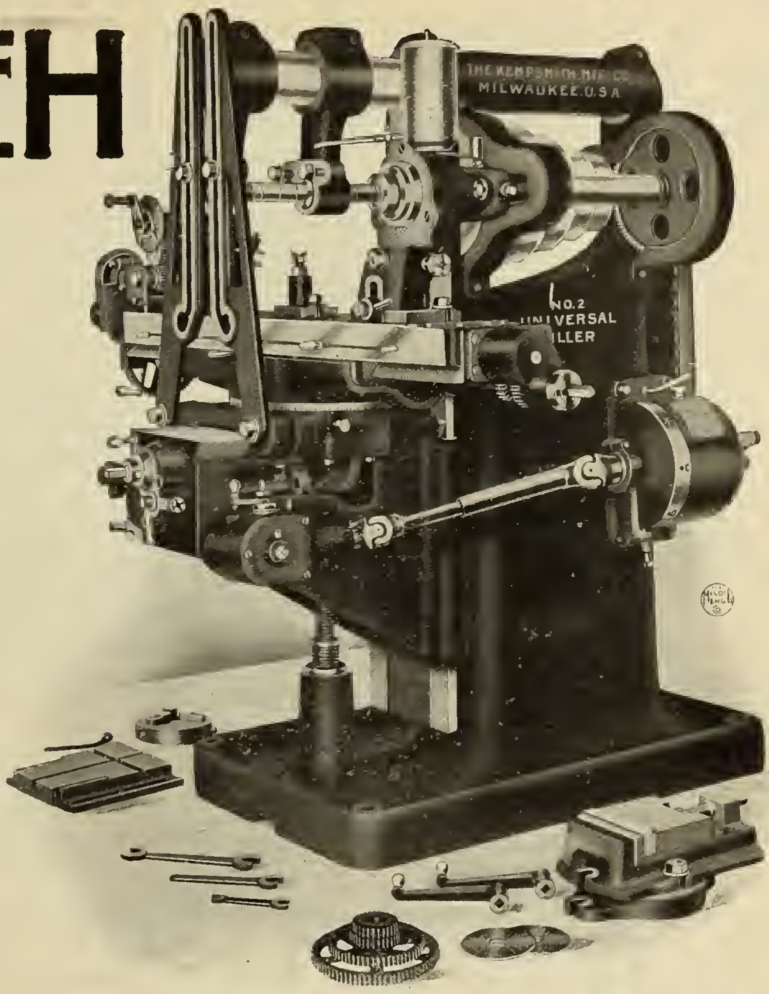
Let us send you full descriptive matter and tell you more about it.

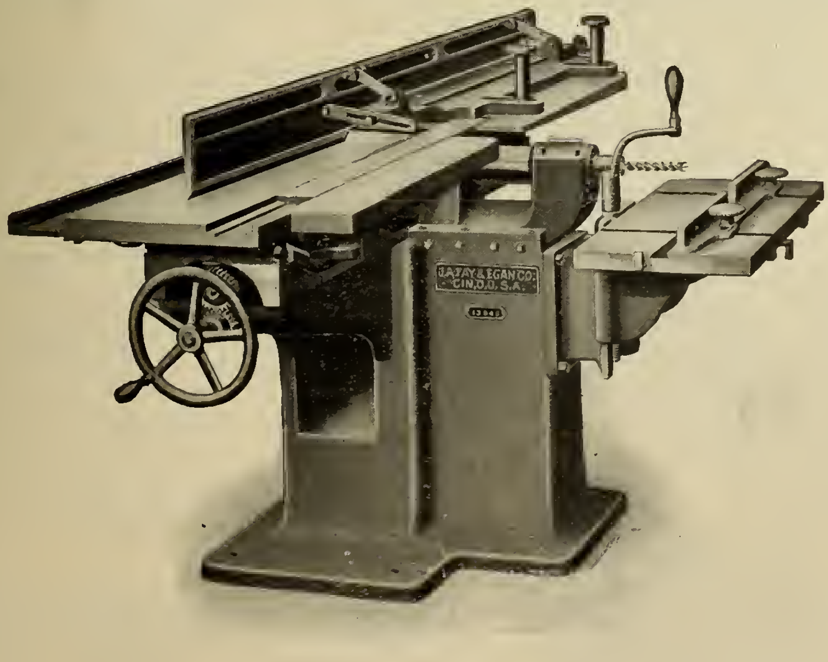
Milling Cutters of all kinds. Machinery and Special Tools built to order. Prompt deliveries and reasonable prices.

THE OWEN MACHINE TOOL COMPANY

Dept. C., SPRINGFIELD, O., U.S.A.

Alfred Herbert, Ltd., Coventry, England, agents for England. Alfred Herbert, Ltd., Yokohama, Japan. Alfred Herbert, (France), Ltd., agents for Belgium and Switzerland. De Fries & Co., Dusseldorf, Berlin and Stuttgart, Germany; Milan, Italy; Barcelona, Spain. Wilh. Sonneson & Co., Malmo, Sweden. Louis Besse, Paris, France. American Machinery Co., St. Petersburg, Russia.





No. 62 UNIVERSAL WOODWORKER

MACHINERY FOR SALE

LATHES

One new 32"x16' New Haven, (triple geared).
One refitted 30"x14' back-geared.
One new 28"x16' New Haven.
One refitted 28"x8' Dundas.
One new 24"x16' New Haven.
One refitted 24"x16' London.
One refitted 23"x10' Perkins.
One new 22"x12' Lodge & Shipley
One new 22"x12' Lodge & Shipley (double back-geared).
One refitted 20"x8' Dundas.
One new 19"x10' Greaves Klusman
One new 19"x8' Greaves Klusman.
Two new 18"x8' Rahn Carpenter
One refitted 18"x8' back-geared.
One new 16"x10' Rahn Carpenter
Two new 16"x8' Lodge & Shipley (patent head.)
One new 16"x6' Rahn Carpenter.
One refitted 16"x6' Gardner.
One new 15"x6' London.
One new 15"x6' Sebastian.
One new 14"x6' Sebastian.
One refitted 13"x4½' back-geared.
One refitted 12"x8' back-geared.
One new 12"x6' Champion.
One refitted 12"x6' back-geared.
One refitted 12"x5' back-geared.
One nearly new 9"x57" Barnes.
One 24"x40"x12' London gap.
One 18"x25"x12' Rahn Carpenter gap.
One 12"x24"x5' Dundas gap.
One nearly new 11"x60" Barnes foot power.
One nearly new 9"x52" Sebastian foot power.
One new 24" Gisholt turret lathe
Four refitted No. 3 Brown & Sharpe turret lathes.

DRILLS

One refitted 36" B.G. hand-feed.
One new 32" B.G. Mechanics.
One new 28" B.G. Kern.
One refitted 26" B.G. Barnes.
Three new 26" B.G. Mechanics.
One new 25" B.G. Kern.
Three new 24" B.G. Cincinnati.
One new 24" B.G. Mechanics.
Five new 20" B.G. power-feed.
Four new 20" power-feed Mechanics.
Three new 20" Mechanics friction.
Two new 16" lever-feed sensitive.
Two new 15½" Knight combined drill and milling machines.
One refitted 15" 2-spindle sensitive
Two new 14" Mechanics.
One new 13" Reed sensitive.
One new No. 14 Silver hand drill.
Two new No. 13 Silver hand drills.
One new 10" White bench drill.
One new 7" bench drill.
One new 14" bench drill.
One refitted 9' ...les radial.
One refitted 72" McDougall radial
One new No. 1 Van Dorn electric. drill.

IRON PLANERS

One 36"x36"x12½' American.
One 30"x30"x8' Dundas.
One 28"x28"x7'2" Gibson.
One 24"x24"x7' Dundas.
One 24"x24"x6½' London.
One 24"x24"x6' Putnam.
One 24"x24"x3' American.
One 23"x18"x5' English.
One 12"x12"x27" American.
One 12"x9"x30" hand planer.

IRON SHAPERS

One 15"x48" openside Cincinnati.
One 15"x30" openside Cincinnati.
One new 32" B.G. Cincinnati.
Three new 24" B.G. Rockford.
One nearly new 24" B.G. Sarnia.
One new 16" B.G. Cincinnati.
One new 16" Smith & Mills.
One refitted 9" gear-driven.
One new 7" Rhodes, hand or power.

MILLING MACHINES

One new No. 2 plain Cincinnati.
Two new No. 3½ Fox, hand and power feed.
Two new No. 3 Fox, hand and power feed.
Two new No. 2 Fox, hand-feed.
One refitted No. 3 Reed Co.
One refitted No. 1½ American.
One refitted 27"x6"x13" Branard Lincoln.
One refitted geared bench miller.

BOLT AND PIPE MACHINES

One refitted 2" American bolt cutter.
One refitted 1" Acme bolt cutter.
One refitted ½" bolt cutter.
One new No. 2 McDougall pipe machine 1"—4"
One refitted No. 1½ Apex pipe machine ¼"—2".
One refitted No. 0 Armstrong pipe machine ¼"—2".
Two 2" hand and power pipe machines.
One 2" Borden hand pipe machine
One 2½"—5" Curtis pipe machine.

POWER PRESSES

Four new No. 21 power presses.
Four new No. 20 power presses.
Eight new No. 19 power presses.
Five new No. 18 power presses.
One refitted No. 2 Fowler's patent power press.
One refitted No. 2 Stiles & Parker power press.
One new No. 1 foot-power press.

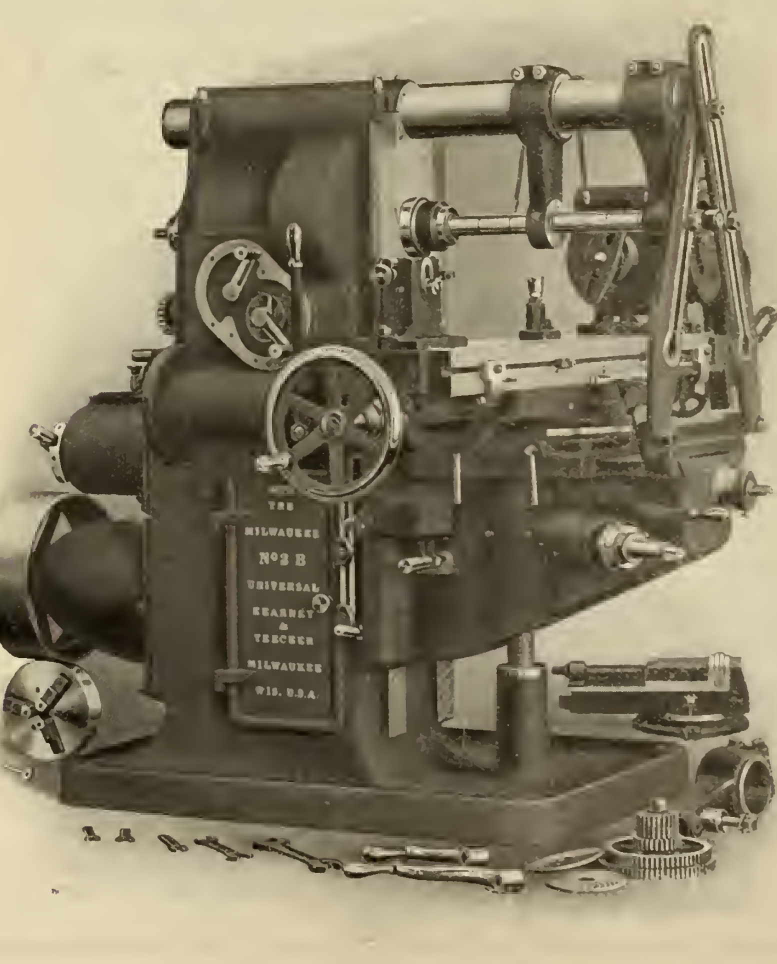
GRINDERS

One cutter and reamer grinder.
One new Universal tool grinder.
One new Cincinnati grinder.
Ten new Pedestal grinders.
Twenty new bench grinders.
One 26" automatic knife grinder.
One Prescott twist drill grinder.
One refitted Huntington grinder and polisher.
Two new American centre grinders

MISCELLANEOUS

One new 30" Gisholt boring mill.
One 36" Gould & Eberhardt gear cutter.
One 350-lbs. Bell steam hammer.
One 400-lbs. Pratt & Whitney drop hammer.
One No. 25 Bradley power hammer.
One No. 5 Bremer power punch.
One 14" Dundas punch and shear.
Four new Hercules hand-shears.
One new No. 7. armor-plate shear.
One No. 1 Buffalo tire up-setter.
One new 2" cutting-off machine.
One No. 2 Pratt & Whitney cutting-off machine.

H. W. PETRIE, Ltd., Toronto, Montreal, Vancouver



THE MILWAUKEE

No. 3B Universal Miller

is one of a line of Plain and Universal Milling Machines for heavy duty service having great weight and structural strength in comparison with range. Powerful drive through single pulley as shown or at right-angles. Electric drive applied without difficulty at any time. All gears and bearings automatically flooded with oil. Every machine equipped with pump for cooling and lubricating the cutters and with means provided for returning the cutting lubricant to its reservoir. Wide table for jig work with ample bearings for maintained accuracy. Accurate screws with sensitive graduated adjustments—all adjusting and feed screws have ball thrust bearings. Dividing wheel double the size usually used—accuracy equal to the best.

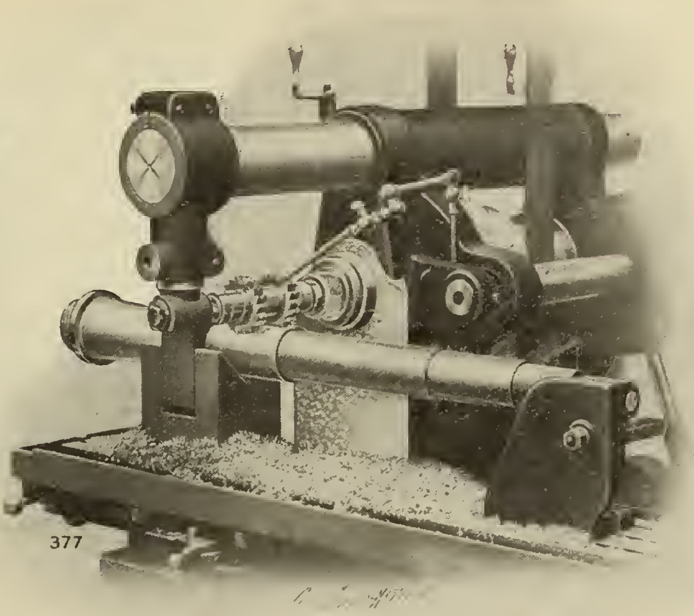
Let us send you more particulars.

Kearney & Trecker Co.

Manufacturers - Milwaukee, Wis.

Agents:
The A. R. Williams Mach'y Co., Toronto
Williams & Wilson - Montreal

MILLING KEYSEATS



The No. 2 Plain "Cincinnati" Miller

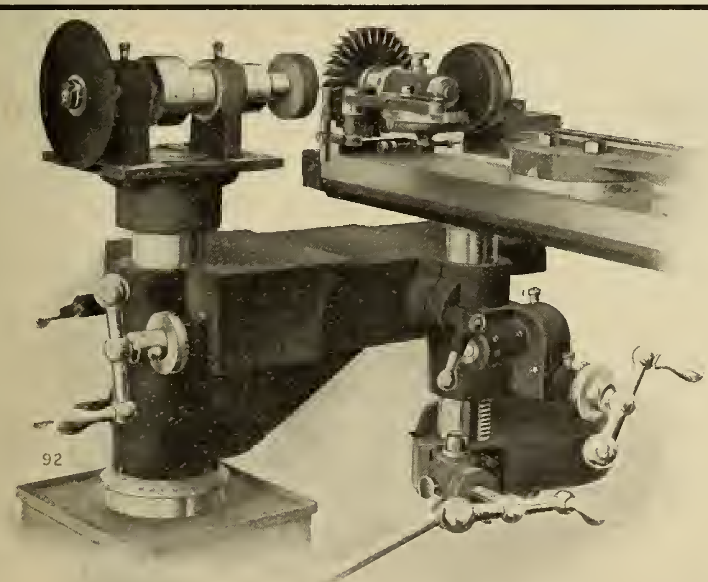
Fitted with cutters $3\frac{1}{2}$ in. diameter running 44 r. p. m., cuts these keyseats 13-16 in. wide by $\frac{3}{8}$ in. deep into crucible steel spindles at a feed of .075 in. per turn—a table travel of 3.3 in. per minute, and does it quietly without any chatter, all of which is additional evidence of the great strength and rigidity of this No. 2 machine.

Are you using "Cincinnati" Millers?

WE ARE MILLING SPECIALISTS

The Cincinnati Milling Machine Company

Cincinnati, Ohio, U. S. A.



IT IS EASY

to keep side mills and similar cutters sharp if you have the right Grinder for doing it. This illustration shows how the

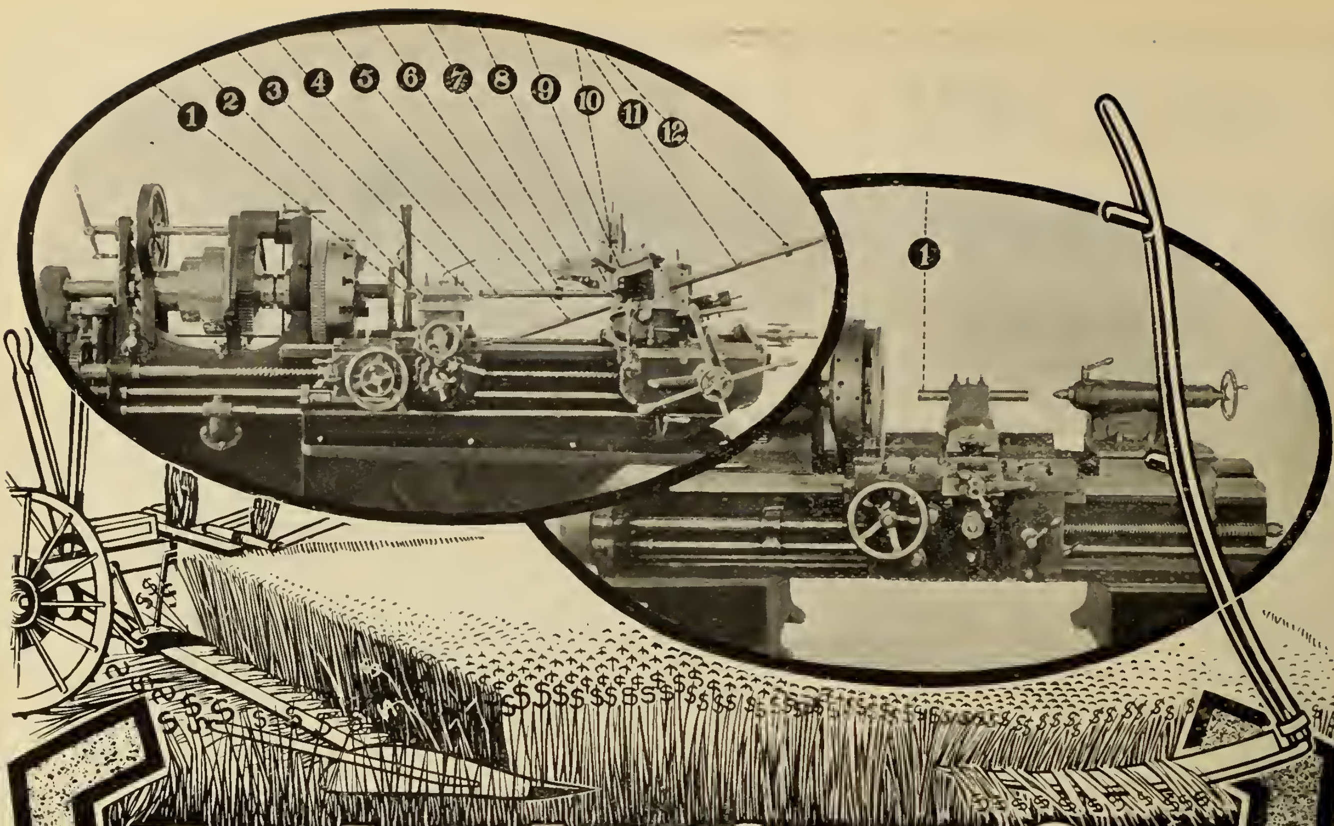
"Cincinnati" Universal Cutter and Tool Grinder

handles such work. The grinding is done with a cup wheel, producing sharp, straight, strong edges, and the clearance is exactly right. Cutters sharpened this way, stay sharp the longest. We tell all about this subject in our Treatise on Tool-Room Grinding. Ask for it.

The Cincinnati Milling Machine Company

Cincinnati, Ohio, U. S. A.

CANADA AGENT—H. W. Petrie, Limited, Toronto, Montreal and Vancouver



Twelve Against One

It's the Multiple Cutters that Count

Time was when the old fashioned scythe with its single blade (like the single tool of the engine lathe) was considered highly efficient for its work. But the advent of the mower and harvester with their greater capacity for work — their many cutters (like the Gisholt Lathe) superseded the old methods — did the work better — faster. Are you still using the scythe methods — the single cutter — on work where more cutters may be used at the same time — more work turned out and with greater accuracy? Isn't it about time to take up these newer methods and increase your output? Isn't it time for you to know what Gisholt Lathes will do for you on chucked work? It is a small matter to take up with us and may be worth hundreds of dollars to you. Our knowledge of this line of work gained by 20 years experience may be of assistance to you in determining the best methods.

One Gisholt will do the work of from 2 to 4 engine lathes.

Write now for Catalogs.

Gisholt Machine Company

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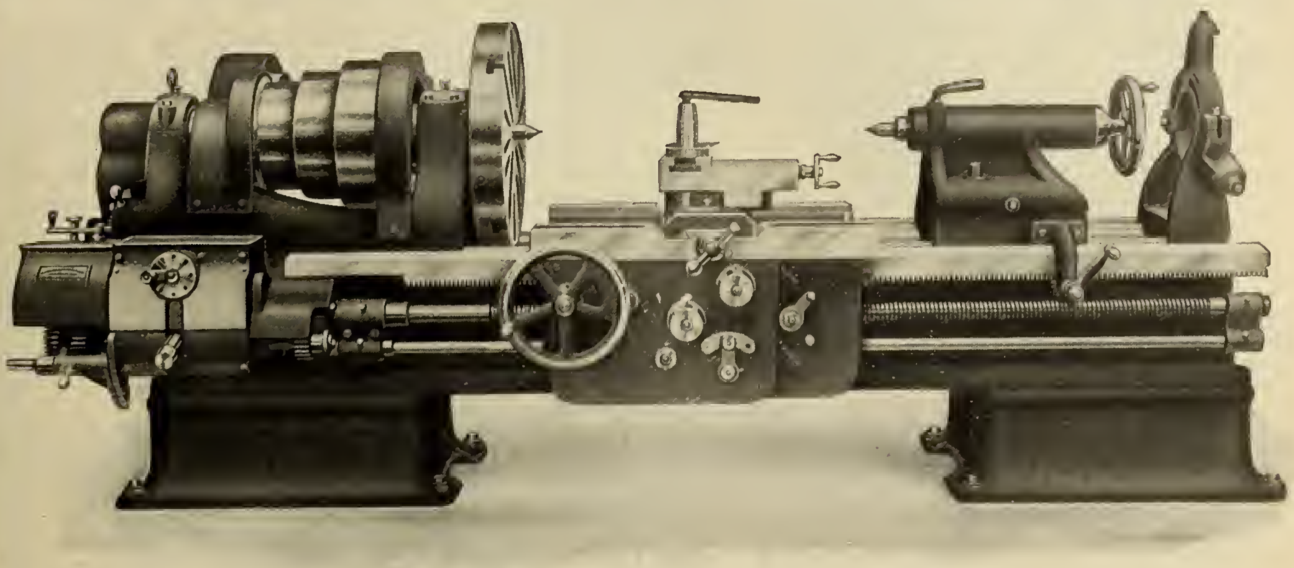
C. W. Burton, Griffiths & Co., London, England.

GISHOLT REG. U.S. PAT. OFF.

Inquiries may also be addressed to H. W. Petrie, Ltd. Toronto and Montreal

MACHINE TOOLS



Schumacher & Boye Double Back Geared Instantaneous Change Gear Engine Lathe

THE TOOL FOR RAPID MANUFACTURING

It is rigid, strong, convenient and efficient under severest requirements of modern shop practice. It has a reverse feed in the head for both feed and screw cutting, power cross feed as well; and its instantaneous change gear gives a wide range of feeds and screw threads. Wide belts, three and four step cones with double back gear give a remarkable range of work from heavy cuts to finishing. Its rigid double plate box apron (a patented feature) gives great strength at a point too often unprovided for in lathe construction.

WE ARE EXCLUSIVE SELLING AGENTS FOR

G. A. Gray Co.
King Machine Tool Co.
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Dayton Machine Tool Co.
Standard Machine Tool Co.
Hildreth Manufacturing Co.
Bruce-Meriam-Abbott Co.
Wile Power Gas Co., (Suction Producers)

ADDRESS ENQUIRIES c/o MACHINERY DEPARTMENT

Rice Lewis & Son, Limited

Toronto

[Norton Grinding Wheels are made of Alundum.]

Reason for Alundum

It is used as the basis of Norton Grinding Wheels because we believe it to be unequalled as an abrasive for manufacturing wheels for all kinds of grinding. And the many years of "Norton Experience" is not a matter to be overlooked by Grinding Wheel users and buyers.

It has the proper temper, and the right kind of fracture for rapid, economical cutting. Uniformity is a prime factor.

It is the product of the Norton Electric Furnace Plant at Niagara Falls.

There is one Norton Grinding Wheel that will do your work better than any other. Give us full details of the conditions and let us help you to select that one wheel.

We'll be glad to send you a booklet on the subject.

CANADIAN AGENTS:
The Canadian Fairbanks Co., Limited, Montreal, Toronto, St. John, Winnipeg, Calgary, Vancouver; F. H. Andrews & Son, Quebec, P. Q.

New York
Chicago
Niagara Falls

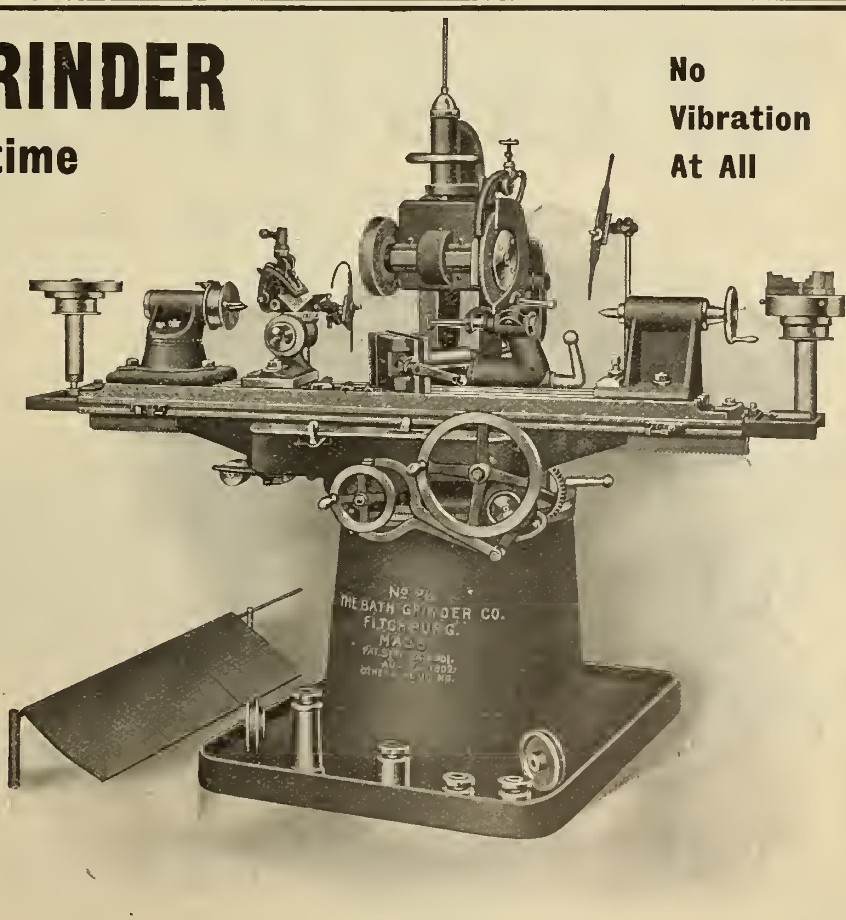
Norton Company
Worcester, Mass., U.S.A.

F. 30

THE BATH GRINDER

Works all the time

No Vibration At All



The uses to which you can profitably put a Bath Grinder insure it being worked all the time. The money you put into it is never idle. The Bath Grinder earns its cost over and over again by its never failing accuracy and immovable rigidity.

It Grinds Wet or Dry

with equally great success, being equipped with a water attachment. It will do all kinds of reamer and cutter work, surface work, face grinding, internal work and cylindrical work on centers.

Write for Catalog!

The Bath Grinder Co.
INC.
Fitchburg, Mass., U.S.A.

EXTENSIVE

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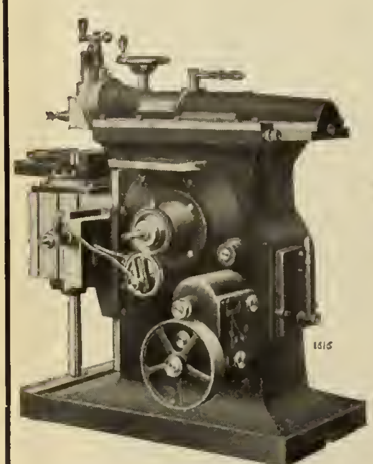

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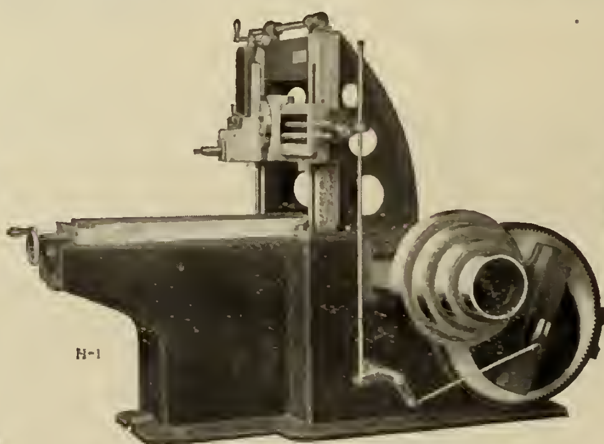

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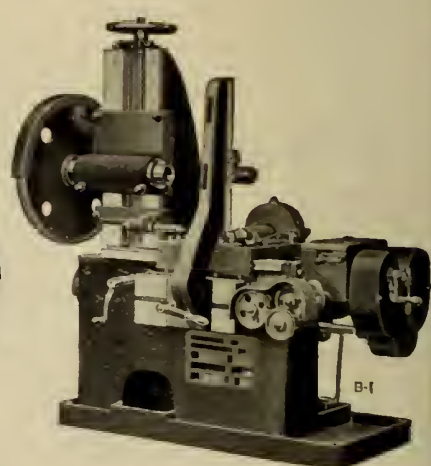

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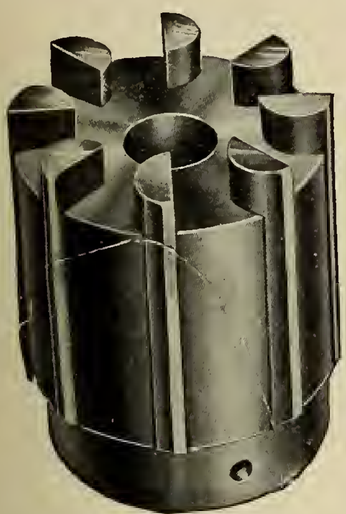

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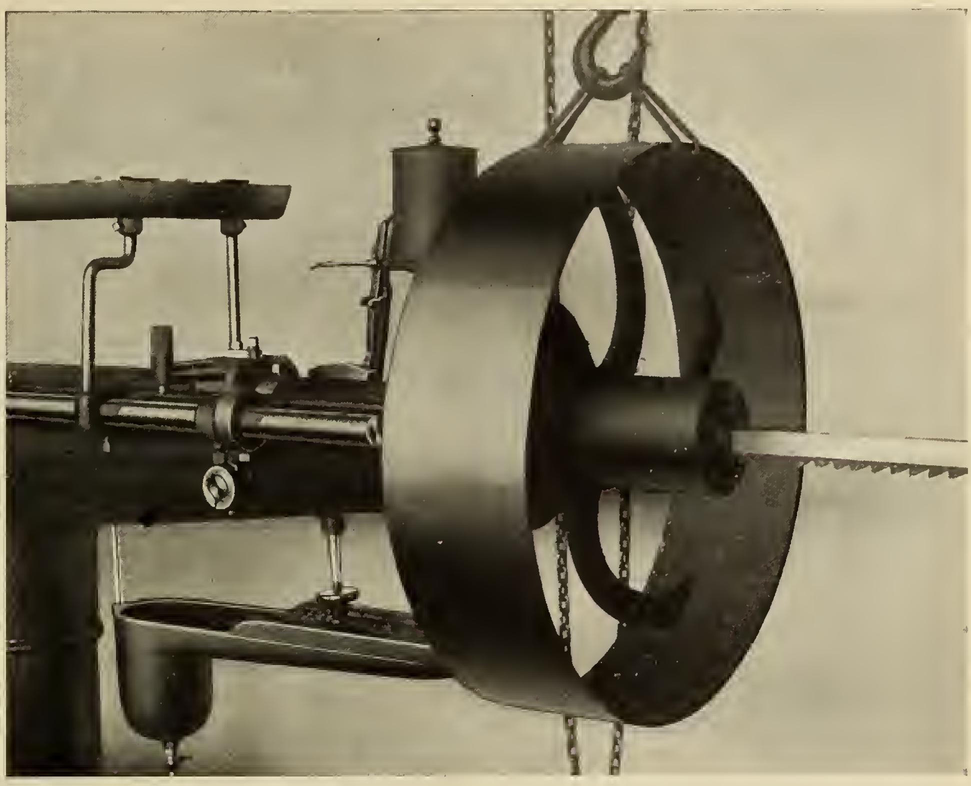

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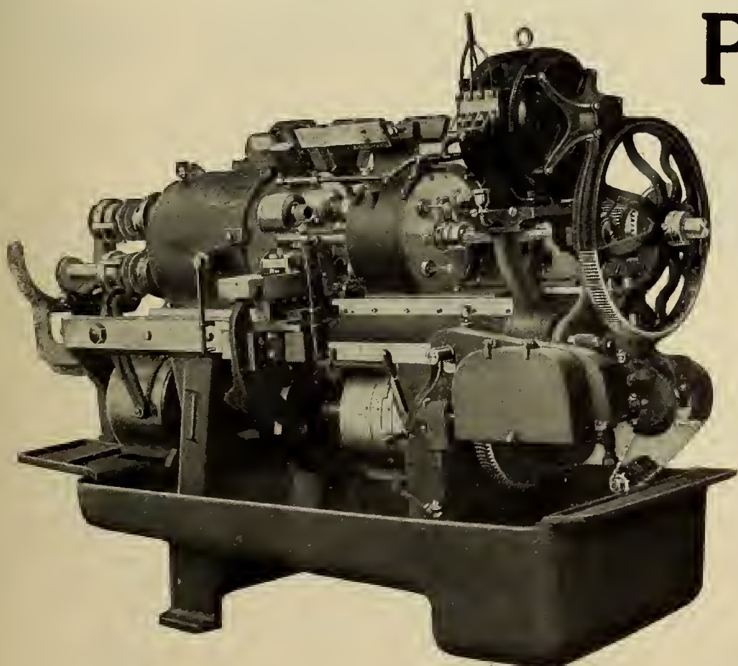

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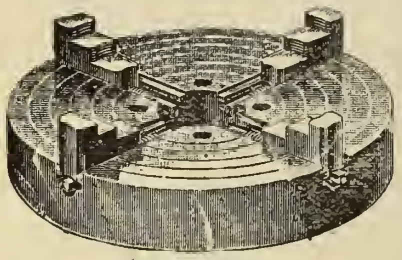

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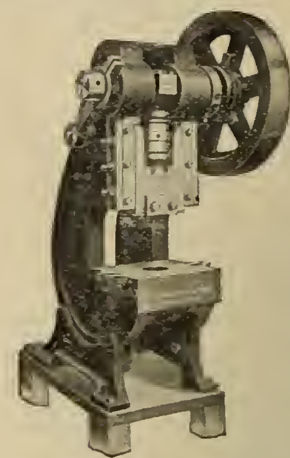

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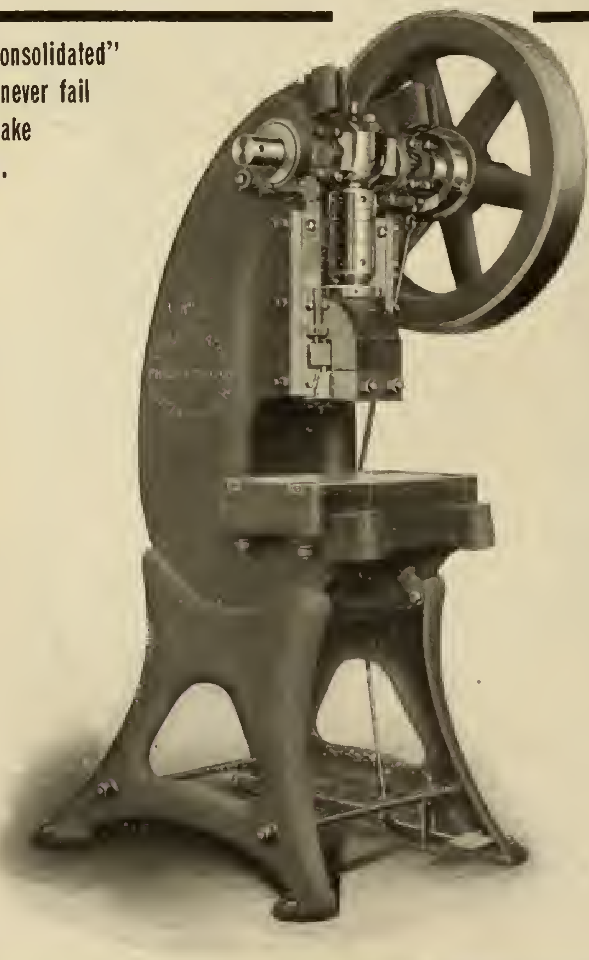

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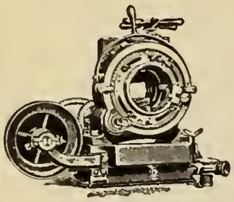

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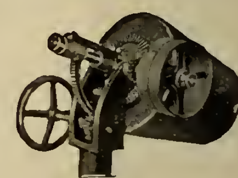

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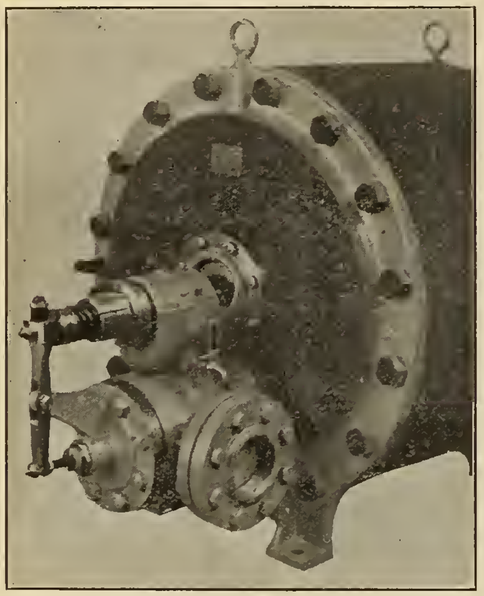

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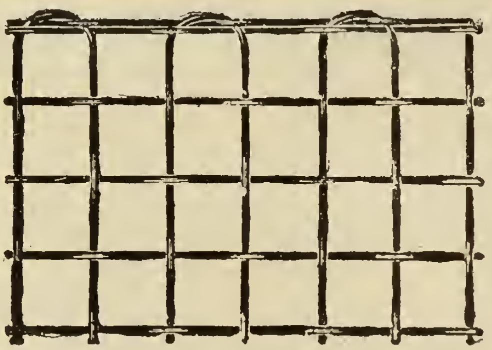

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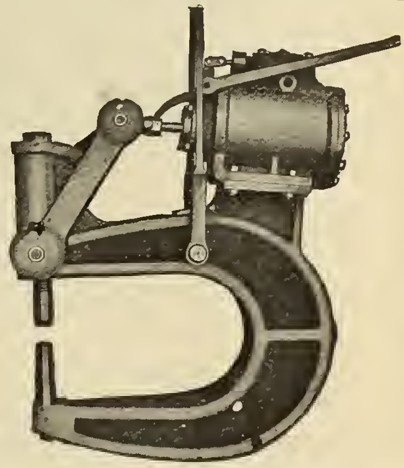

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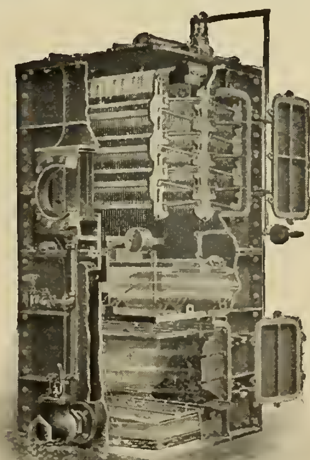

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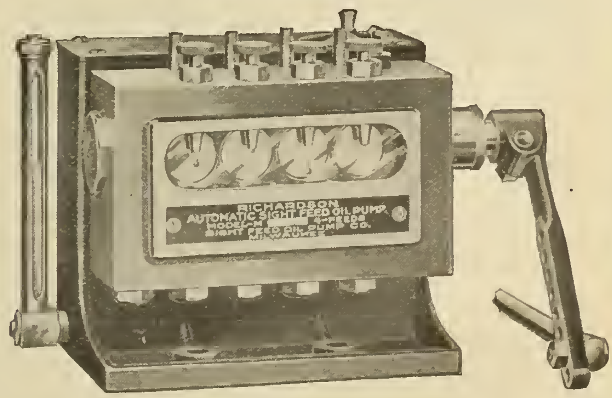

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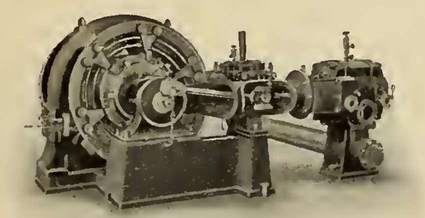

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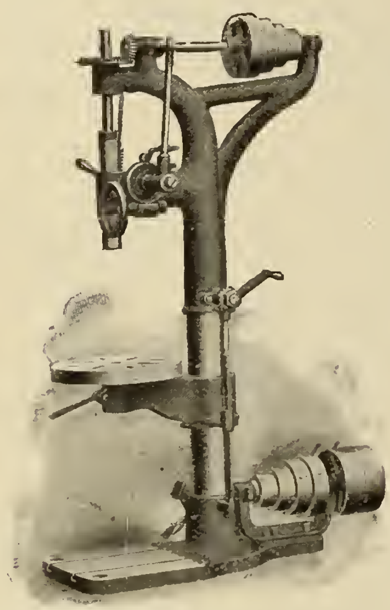

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New Automatic Gear Cutting Machine with Unique Features

Made by Cincinnati Shaper Co.—Ingenious Arrangement of Dogs Limiting and Reversing Movement of the Cutter Slide.

A new automatic gear-cutting machine has been placed on the market by the Cincinnati Shaper Co., Cincinnati, O. This machine has some features which make it interesting. The main features in the design of this machine as may be seen in Figs. 1 to 4, are its simplicity and compactness, together with its rigid construction and the ease with which it may be adjusted. The bed has been considerably shortened, without decreasing the length of the cutter slide bearing, this being made possible by extending the cutter slide forward of the cutter spindle, so that it extends past the face of the column when at the forward extreme of its travel. It is gibbed with rectangular guiding surfaces instead of the usual dovetail bearings, and has a long taper gib for taking up the wear. The same form of bearing and gib is used for holding the work saddle to the face of the column. In the case of both the work saddle and the cutter slide, the length of the guiding surface is much greater than its width, thus making any binding action impossible. This is particularly important in the case of the work saddle, since it prevents the work spindle and blank from dropping out of parallelism when the clamps are loosened for adjusting the work for the tooth depth. This fault, found in many gear-cutting machines, makes the micrometer reading of the screw practically worthless.

Both cutter and work spindles are of large diameter, are accurately ground, and are journaled in bronze bushings with provisions for taking up wear. The journal of the cutter spindle is adjustable endwise for centreing the cutter to a gauge furnished with the machine. The cutter spindle is driven by worm gearing provided with means for taking up the end thrust wear of the worm. The cutter end of the spindle has a No. 10 Brown & Sharp hole for the cutter arbor, which is keyed to the spindle, and is drawn in or forced out by a threaded bolt. A removable bearing is provided for supporting the outer end of the cutter arbor.

Fig. 1—Front View of Gear Cutter.

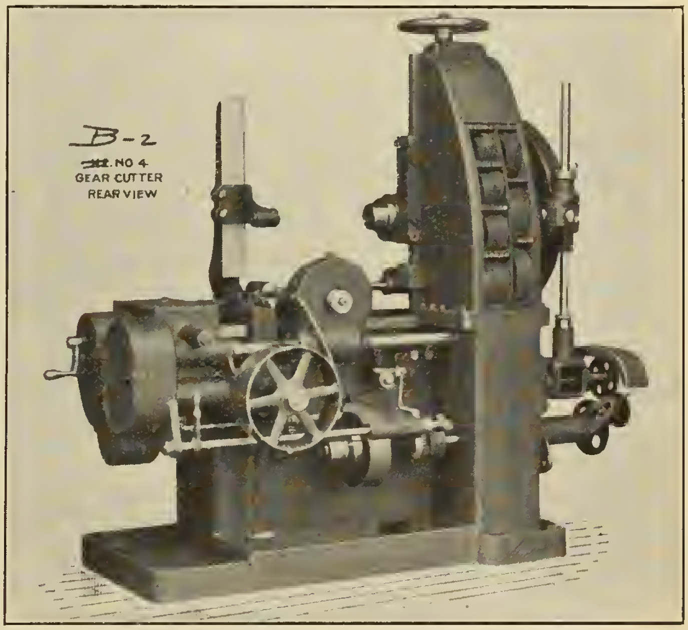


Fig. 2—Rear View of Gear Cutter.

All of the mechanism is driven from one single speed pulley N (see Figs. 3 and 4), the various changes for the feeds and spindle speeds, as well as the indexing, being obtained by change gears. Great care has been taken to provide short stiff shafts for the connections between the driving pulley and the spindle, so as to avoid torsional vibration in the members to which they transmit power. The driving pulley is connected by bevel gearing with a short shaft extending into gear box O. The swinging door, shown at the end of the gear box, in Fig. 2, covers the change gearing by which the desired spindle speeds are obtained. This change gearing gives six rates, ranging from 28 to 146 revolutions per minute. A splined through the worm carried by the cutter slide, thus driving the spindle. The shaft P leads from the change gearing drive, it will be seen, is simple and direct.

The gears for altering the feeds are mounted underneath the guard at the front of the machine in Fig. 1. They provide for ten changes, ranging from 1 to 7¼ inches per minute. Change gears for faster feeds can be furnished if desired. The feed of the cutter slide is effected by a screw, whose motion is controlled by positive clutches, operated by reverse lever K. The clutch for the quick return is cushioned to prevent undue shock. The feed motion and the indexing mechanism are so interlocked that it is impossible for the cutter to be fed forward until it has been indexed fully to its new position. All the movements have to take place in proper sequence, it being impossible for any one of them to begin until the succeeding ones have been completed.

An ingenious feature of the machine is best shown in Figs. 3 and 4. This is the arrangement for adjusting the dogs by which the movement of the cutter

slide is limited and reversed. At the front of the bed are two shafts A, with ends squared for cranks. These are carried through to the rear of the machine where they are keyed to spiral gears B engaging mating gears C on screws D. These gears are keyed to the screws which thus turn with them, while still being allowed to move endwise through a limited distance. Stops F, G, and H are carried by screws D. Stop F is fixed as to longitudinal position on outer screw D, but allows the latter to revolve freely in it. Its inner end is supported by a slide screwed to the base of the machine, so that it thus helps to support both of screws D. Stop G is threaded on the inner screw, and slides loosely on the outer one, while stop H is threaded on the outer screw and slides on the inner one, as best shown in the upper detail view in Fig. 4. By this means the revolving of the left-hand shaft A adjusts stop G, while the revolving of the other adjusts stop H.

Tappet E, in the cutter slide, normally acts on stops G and H to reverse the motion of the cutter slide when it has reached either extreme of its travel. When striking H on its forward movement, it forces screws D to the left, thus moving spool J, which throws reversing lever K, returning the slide to its forward position. Here the tappet strikes dog G, which throws the spool J, and with it the reversing lever K in the other direction, starting the slide forward again on the feeding cut, though this is not allowed to take place until the indexing movement has been completed, as previously explained. By withdrawing pin E out of the reach of stop G, the return of the slide may be allowed to continue until E strikes fixed stop F, which is the extreme limit of the table movement in the backward direction. It is thus unnecessary to alter the adjustment when it is desired to run the slide clear back. This arrangement makes the setting of stops possible from the front of the machine, and it is easily effected before the machine is started, by proceeding as follows: The cutter slide is run to the extreme forward position desired and then, by means of the crank, dog H is run against the tappet E until the reverse lever throws the clutch over to engage the reverse side. Then the cutter slide is run back by hand until the desired back position is reached, when dog G is run against the tappet until the clutch is thrown over to engage the feeding movement. Then, as is easily seen from the above description, the cutter slide will reverse at these positions. The crank for operating the cutter slide feed-screw is permanently mounted in place, but disconnects itself automatically when not being manually operated, so that it does not give trouble from its balance wheel effect as it rapidly revolves, or from catching in the clothing of the operator.

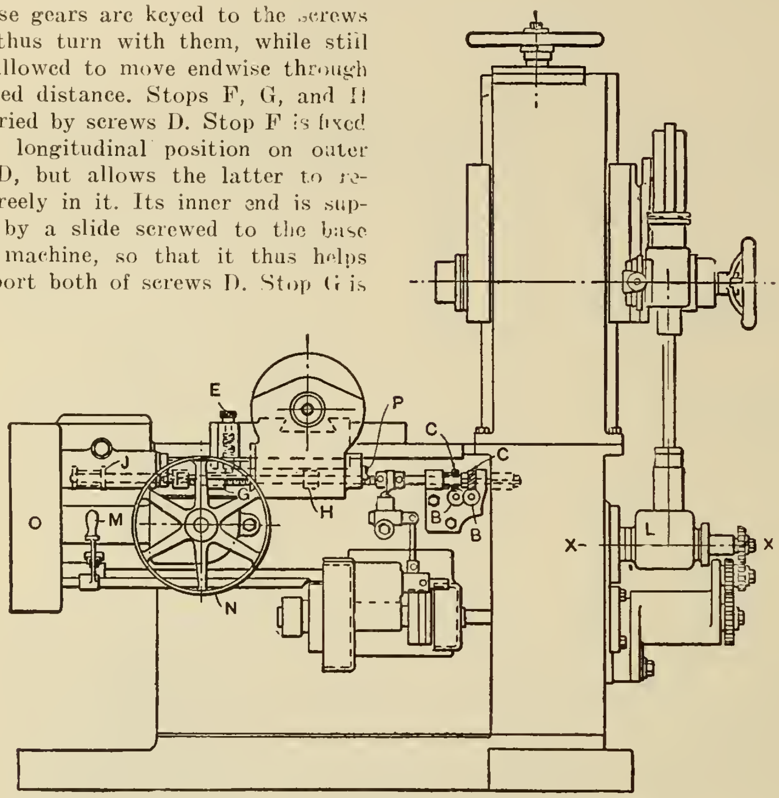


Fig. 3—Diagram of Rear Elevation of Machine.

The indexing mechanism is effective, yet free from trappy, complicated parts. It operates without shock and is easily accessible. As has been mentioned, it is so interlocked with the feed-screw that the cutter cannot enter the work until the indexing has been completed. The number of gears in the indexing train has been reduced by the novel means provided for disengaging the index worm from the wheel. This is shown in Fig. 3. The vertical index worm-shaft is driven by bevel gearing in box L, which may be swung about axis XX. In throwing the worm out of connection with the index worm-wheel, the worm-shaft is simply rocked about its axis, suitable provision being made in the mounting of the worm for guiding it and bringing it back to its proper relation with the wheel. The index wheel is made in two parts, by the method commonly followed in such cases to insure the required degree of accuracy. The work spindle may be made to space once or to revolve continuously, by the operation of the indexing lever shown near the gear casing at the left of Fig. 2. Index gears are furnished to cut all numbers of teeth from 12 to 100, and, with the exception of prime numbers and their multiples, from 100 to 450. Special gears for cutting other numbers of teeth are furnished at an additional cost, if desired.

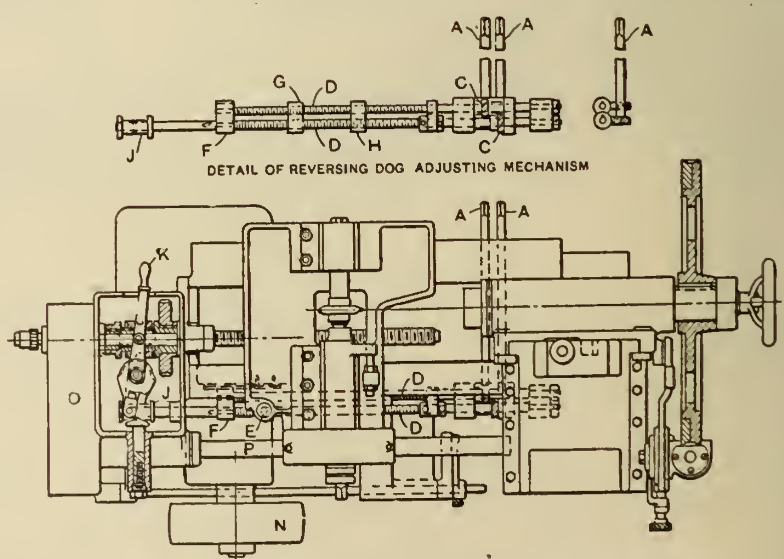


Fig. 4—Plan of Gear Cutter, With Detail of Stop Adjusting Mechanism.

This machine is at present made in two sizes for cutting gears of 36 and 48 inches diameter, respectively, up to 10

inches width of face. It will cut 3 diametral pitch in cast iron and 4 diametral pitch in steel. An outer support is provided for the work arbor, as well as a roller support for the rim of the gear blank. The net weight of the machine and countershaft is 4,000 pounds. The machine may be very easily arranged for motor drive, a constant-speed motor being secured to an extension of the base, and connected with the constant-speed driving shaft by spur or chain gearing.

Manufacture of Grinding Wheels from Alundum

How Alundum is Made in Electric Furnaces—Manufacture of Grinding Wheels, and Data Concerning Their Use, Running Speeds, Etc.

By W. S. HOWE *

One of the remarkable advances made along mechanical lines in modern times has been the development of grinding. The field of the old grindstone was limited, and the sharpening of edge tools was almost its only use. The introduction of the emery wheel, however, made grinding a very important operation. The emery wheel not only rapidly replaced the grindstone but in many operations the work of the lathe tool, file and other steel cutting tools is now done more efficiently by grinding.

Before the invention of the electric furnace, artificial abrasives suitable for grinding-wheels were unknown. Wheel manufactures necessarily depended upon natural products—chiefly corundum and emery. As emery occurs in considerable quantities in various parts of the world it came to be recognized and used as the chief raw material for grinding wheels and other products employed in grinding metals. On this account the modern grinding wheel made of any abrasive is popularly known as the "emery wheel."

Alundum Made in Electric Furnace.

During the past few years the Norton Co. has been operating an electric furnace plant at Niagara Falls, in which has been developed and brought out an abrasive known as alundum. The process of making alundum consists in taking the purest amorphous oxide of aluminum found in nature, and known as the mineral beauxite purifying and melting it in immense electric furnaces. Upon cooling, this molten mass solidifies in solid ingots of alundum. Beautiful crystals are found in the centre of these masses, showing nearly all the variety of colors found in the ruby and sapphire, of which alundum is one variety. The rarer colors of light pink, blue and purple, found in Oriental gems, are sometimes noticed in small crystals.

Beauxite, the raw material from which alundum is made, is the purest naturally-occurring amorphous oxide of aluminum known. This mineral was originally found at Baux, France, from which it derives its name, but purer forms are now obtainable on this continent.

The beauxite is heated in calciners to drive off the combined water and is then melted directly in electric furnaces of special design. It was not practical to fuse beauxite commercially until the invention of this process. The temperature in these furnaces probably ranges from 5,000 degrees to 6,000 degrees, Fahrenheit.

The operation of these furnaces and the composition of the molten bath is under the control of the furnace operative. Exact quality and uniformity which is so important in steel manufacture, is fully as important in the manufacture of alundum. The highest grades of steel are now being made in electric furnaces because impurities can be removed at the high temperatures obtained by the electric arc, and the quality of the molten bath uniformly maintained. In the alundum furnace both the purity and uniformity are looked after. Each step in the process is under the close supervision of expert chemists who follow the work by careful analysis in the company's chemical laboratory.

After the ingots of alundum have cooled, they are broken up and the pieces are then reduced to smaller pieces by means of powerful crushers. After this reduction, the material is still further reduced by being passed through smaller crushers and several sets of grains which are required in the manufacture of grinding wheels. After passing through rolls, it is subjected to the usual washing and drying processes to prepare it for manufacture into grinding wheels, rubbing and sharpening stones and other articles.

Making of Wheels From Alundum.

The making into grinding wheels is accomplished by the Norton Co. at their Worcester works, where the product is cleaned and given the final preparations. The alundum is heated and conveyed over an electrified drum which takes out the iron and foreign substances, leaving pure crystals. It passes through a series of rocking screens and each grade is sorted and washed. The product of the 10-20 mesh is used to manufacture wheels for grinding large grey iron castings and the coarsest steel. The 16 is the most popular size for heavy steel grinding. The best wheel that can be recommended for general work is grain 36, grade P. For tools such as reamers and milling cutters, ground by machinery, softer wheels are required than when grinding them by hand. Stove castings and wrought iron take very hard and coarse wheels. Brass and aluminum take wheels of about the same hardness as for wrought iron. In cleansing, the dust is removed by washing and the product is steam dried for commercial use. The dust is collected in a concrete reservoir by settling from the water used in cleansing the product.

In order to insure rapid and continued cutting so far as sharpness is concerned, a peculiar quality is necessary. There must be a fracture that will give a number of sharp-cutting points. Alundum is a fracturous material and the bonding material used, quartz, clay, etc., is 50 per cent. cutting material.

Automatic mixing kettles prepare the material for the molds and the ingredients are carefully measured and allowed to settle in the molds so that there is absolute uniformity. Uniformity is one of the most important requisites in an abrasive. The ability to duplicate grinding wheels is essential to obtain the best results. In grinding wheels the abrasive grain of a given size is bonded together to produce a certain grade or temper for a certain kind of work. The term grade, as applied to wheels to designate the degree of hardness, is the resistance of the particles to the pressure employed in the act of grinding. A wheel from which the particles are easily broken is called soft, while one which retains its particles longer is called hard. Wheels are graded from soft to hard, depending upon the class of work on which they are used. Different grades of wheels are obtained, according to the amount of bond employed, the wheel becoming harder as the amount of bond used increases. Different grades are required for different materials to be ground; cast iron, steel, brass, glass, bone, leather, wood and other substances demand wheels of special grade which must be duplicated to make the grinding operation continuously efficient. It is for this most important reason that great stress is placed on evenness in quality of the abrasive itself.

The wheels, when taken from the mold, are packed in quartz, in a fire clay receptacle, and baked from three to seven days, depending on the ovens and wheels. The timing is done by a

* Manager small tool and supply department, Canadian Fairbanks, Montreal.

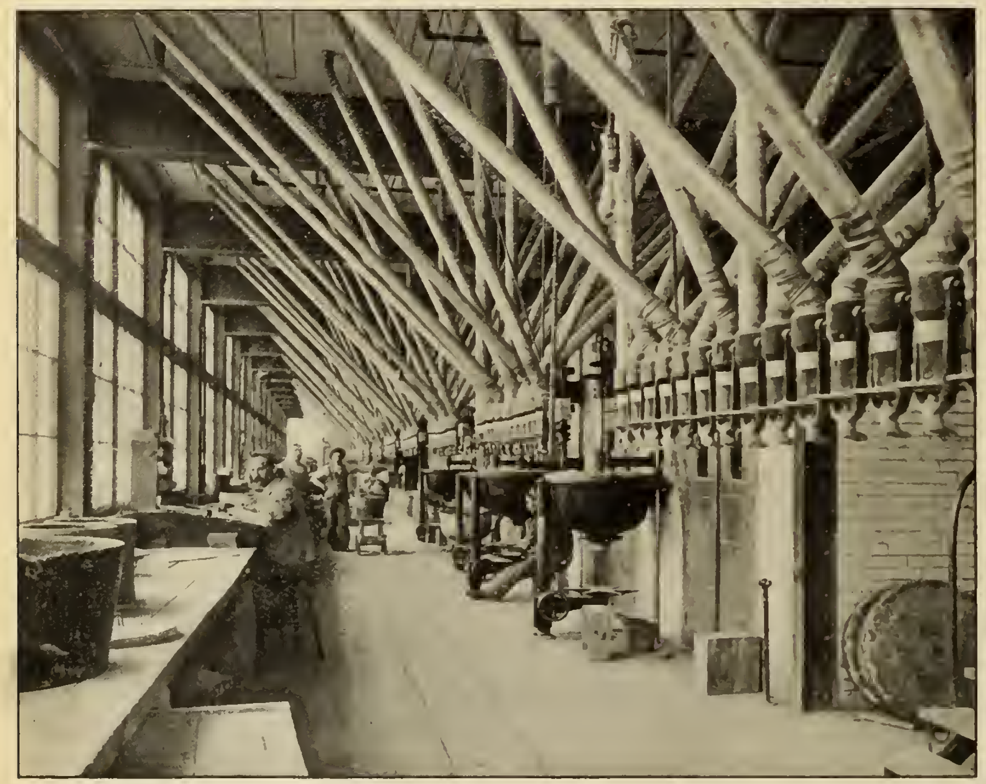
fuse. Several days are allowed for cooling and the wheels are then ready for bushing, truing, testing and use.

Operation of Grinding Wheels.

The surface speed recommended is 5,280 feet per minute, but when a wheel works hard, decrease the speed and the good effect of a soft wheel will be obtained. All wheels are carefully tested to several times their recommended speed. In a breaking test a Norton alundum 18 in. x 2 in. wheel of 24 T grade, which is hard, ran at 2,700 to 2,800 r. p. m. for four minutes and forty seconds, giving a surface speed of 13,188 ft. per min. and a stress of 522 lbs. per sq. in., five times greater than when at its running speed.

edge of the grain. Hard wheels hold the dull points and glaze thus scratching the material instead of grinding it. Best results are obtained from clean, true wheels running on rigid foundations—the less the vibration the truer is the finished work. The cutting power of a general utility wheel is greatly increased by keeping clean and in proper condition. A Huntingdon emery wheel dresser, sold universally by hardwaremen, has been found to give good satisfaction.

Too great care cannot be exercised in the selection of a wheel. For soft steel use a sharp rapid-cutting wheel, but for hard steel use a wheel that cuts when running much slower. The diameter of the work also affects the efficiency of the wheel. A wheel that works well on a small diameter may not answer on work of a large diameter, while a wheel for a large diameter work, wears away rapidly on small work. To be able to choose the right wheels requires education and in a mechanic's apprenticeship, if he is taught right ideas it will save many dollars for his employer. A man requires to make a study of grinding and thus we find in this age of specialization, men who study and know a grinder and the various wheels to use for different work are included among the highest class of mechanics and among the highest wage earners of to-day. The saving in employing such a man will yield returns that will surprise many concerns who treat the matter of grinding wheels with indifference.



A View of the Interior of the Plant Where Alundum is Made.

For grinding a hard material use a soft wheel, and for a soft material use a hard wheel. Use a high speed for hard wheels and for a soft wheel use a low speed. If a wheel glazes or fills it may be an indication that the wheel is too hard for the work or speeded too high. The same periphery rate should be maintained as the wheel wears down; in other words, the speed of the spindle should be increased correspondingly as the diameter, of the wheel is decreased. Complaints are not uncommon that wheels appear softer towards the centre; this is in cases where they have not been speeded up as they wear down, so that the periphery rate becomes slower, which causes the wheel to wear away and appear softer. The glazing is a dulling of the cutting

In those shops where specialists are not employed, it is best to leave the selection of the right wheel to the manufacturer after giving him full details of the work for which the wheel is intended. It is not only necessary to state the dimensions, but also what kind of material is to be ground, whether the contact is large or small and whether the wheel is to be in charge of one man or accessible to all the workmen in the shop. To give definite data of the material to be ground is imperative and as to accessibility of the wheel, the manufacturers would ordinarily regulate the grade, supplying a tougher grade for general utility than for cases where the responsibility rests with one man.

SOME POINTERS FOR SALESMEN.

If Sheldon had a salve that would give every business candidate the Salesman's Itch, I'd take his whole output on suspicion. The salesman who makes the record is not the one who knows the most or the one who is the best looking; he's the smiling cuss who never hears the word "NO."

The Salesman's Itch!

Buyers in loose wrappers do not wait for you around the corner.

You have to go after the buyers very much as the Romans went after the Sabines. It is persistency that wins.

The buyer is a shy and sly proposition. He likes to be chased.

The man who gets the order is the one with the Salesman's Itch.

There are two departments to every business. One is Out-Go, and the other is In-Come.

When times are "scarce" the Out-Go men are cut down or laid off; and the lads who lay them off are the In-Come boys.

Get the Salesman's Itch—a nose for orders, a scent for fromage.

Nail the business. Promises do not meet the pay-roll.

Cultivate the Salesman's Itch.

Salesmen who expect buyers to chloroform them and stuff the orders in their pockets, are doomed to disappointment.

It is certainly true that you can not afford to sell a man goods that are going to burden him, but it is also true that it is for you to decide as to what a customer needs, and then see that he gets it.

Buyers, through habit, fight on the defensive.

There are various ways of overcoming their scruples, but unless you have the Salesman's Itch, you'll wander forever a lone, lorn, hollus-chickie, and Clio will carve on your tomb a single word: Skunked.—Elbert Hubbard, in the Philistine.

MACHINE SHOP METHODS AND DEVICES

Unique Ways of Doing Things in the Machine Shop. Readers' Opinions Concerning Shop Practice. Data for Machinists. Contributions paid for.

HOLLOW MILLS.

By F. E. Lauer.

In many shops hollow mills are extensively used and in others they are almost unknown. They are a valuable tool if rightly made and used on work to which it is adapted. At one time they were extensively used on screw machines much more than at present, the box tools displacing them in a good many shops now, but nevertheless some of the leading manufacturers consider them indispensable.

Hollow mills should be made from a good grade of tool steel containing about 1½ per cent. of carbon and better still with a higher percentage, providing necessary care is taken when the tool is hardened. The forms of mills vary, the method of making depends on the use to which it is to be put. When used for roughing work, when exactness of size is not particular, there are no means allowed for adjustments; but when the mill is used for finishing accurately to size, it is made adjustable and if possible made with inserted blades of high speed steel, if the quantity of work permits of this expense. Hollow mills must be given clearance so that they may not bind when in use, and this is done in several ways, one of the common methods consisting in making the hole tapering, having its smallest size at the cutting end. Fig. 1 shows a mill in which the hole is enough larger at B than at A to prevent hugging the work which would cause roughing and twisting of the work. It should be slightly tapered from the shoulder at B to the cutting edge. Another form of clearance is obtained by working of the lands as shown at A, Fig. 2, the relief is carried to face B, but none of the stock at this point should be removed if the hole is large enough the land may be removed with an end mill, but if small, must be filed away.

Roughing hollow mills are used for removing the bulk of the stock, leaving a sufficient amount for the finishing mill or box tools. Sometimes in order that we may start on the stock easily, the form of mill as in Fig. 3 is used. Roughing mills are made solid usually, and the teeth made much more solid than the finishing mill.

The adjustable hollow mill has its teeth cut deeper than a solid mill; that is, they are longer and more slender, so as to allow them to spring for the desired adjustment which is sometimes controlled by a collar as in Fig. 4, and sometimes by the collar as per sketch 4 A, when the adjustment is made through the ring by screws, and again the mill may be turned slightly tapered on the outside and a ring of corresponding taper made to fit it by tapping down the collar further on to the tapered portion some mechanics claim that a more uniform adjustment of each tooth is received.

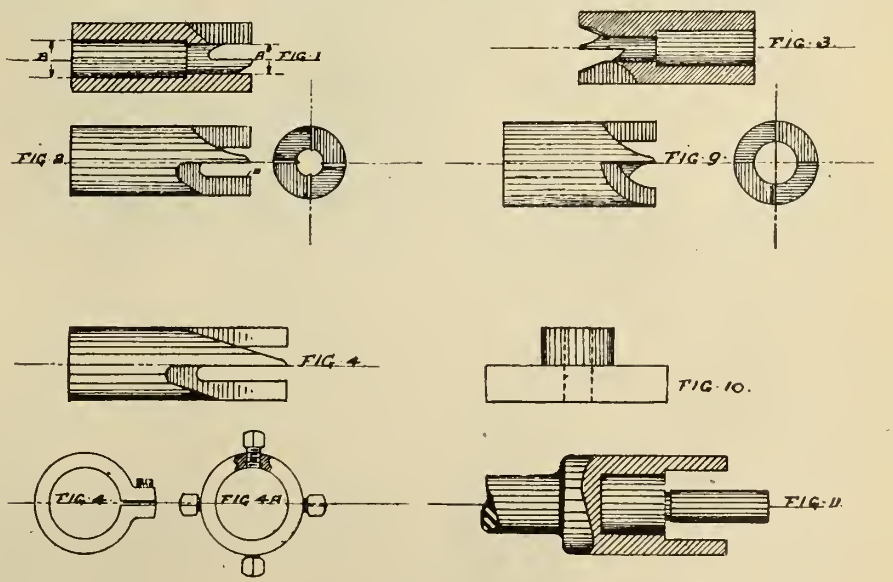
As before stated when cutting teeth of adjustable mills, they must be cut deeply, longer and more slender than for solid mills so that they may be sprung together to provide means for adjustment for size; they must, however, be strong enough at the bottom to prevent chattering.

When roughing mills are to be used in screw machines for roughing down square or other forms of irregular stock as well as round stock, it is well to bevel the tooth at the cutting end in the form of a V, as shown in Fig. 3, so that the tool may follow the cut made with this mill by the tools whose end is of the form shown in Fig. 9.

Roughing mills do not require as many teeth as those used for finishings, the fewer the better, providing that there are enough to properly support the work, as this leaves more room for chips. Chips are the most troublesome thing a machine has to contend with in the ordinary processes of machinery with tools whose edges are formed of a number of teeth. The teeth of the roughing mill should be short and stubbed, so as to provide strength. Ordinarily there are four in number, although for certain work, three have been found preferable. When roughing mills are used on round stock, three teeth work very well. If square stock is being cut a mill having four teeth will work more satisfactorily as the opposite corners will be supported at the same time.

It is sometimes desired to machine a projection true with a hole as indicated in Fig. 10. This may be accomplished by using a mill having a pilot as shown. As mills of this character are rarely used on small work, it is generally feasible to grind the walls of the hole to size and with the necessary clearance after they are hardened. When possible, make the hole to receive the pilot large enough so that it may be ground at the same time to insure concentricity. Fig. 11 illustrates a mill having a hole of this style, the pilot being made with two sizes to accomplish the desired result.

Unless quite a number of tools of a kind are made in a shop, it is not thought advisable to make special fixtures and holders for doing the work. As a consequence the operator is called upon to improvise something that will accomplish the desired end, yet do away with the cost of special tools required when work is done in quantities. The man who can devise methods and ways of producing accurate work where the necessary machines and tools are available, and can do it satisfactorily with-



Hollow Mills.

out materially increasing the cost, is a valuable man. Now we all know that the only means provided for holding work of the character under consideration in the ordinary universal grinder, is a three or four-jawed chuck. If the chuck is universal jawed it is in all probability not true, and if it is an independent jawed chuck it is almost impossible to turn the piece of work to run as we wish it to. While this may be accomplished very nicely on the lathe where we can detect any errors by means of an indicator, the circumstances are so entirely different with the grinder that it becomes a very difficult task. However, we may get the work true by holding the back end in a collar held in the chuck. This collar should have a hole a few thousandths of an inch smaller than the end of the piece we wish to grind. After securing a collar in the chuck the hole may be ground to a size that allows of twisting the work into it sufficiently tight to hold it while grinding. If the piece of work be long the other end may be supported in the back or the centre rest.

GAS ENGINE VALVES.

By H. J. Church.

One of the many difficulties which the mechanic of to-day has to face is the insufficient care taken in machining work, preparatory to delivery to vise hands for assembling. Especially so is this the case with gas engine valves. A valve which has been carefully machined and chucked can be ground into place in a half or quarter the time it takes to fit a carelessly turned one. The modern gas engine valve is usually made of mild cast steel, of a quality known as "machining grade," of which the drop forgings, Fig. 1, are good examples; the tips should be removed in finishing. It is quite common, however, to see the exhaust valve made with a cast iron face riveted on to a steel spindle; although this is a somewhat crude method, it will be found to work satisfactorily for the exhaust valve. The inlet valve should in all cases be of mild cast steel, as this valve requires to be as light as possible, consistent with the necessary strength.

The valves are generally conically seated valves, with faces at from thirty-five to forty-five degrees with the axis of the spindle. It is in the careful machining of this face that a considerable amount of time is saved on the assembling floor. It is essential that the cut taken be not so heavy as to spring the face out of true with the spindle, jarring of the tool should be avoided, as it tends to form pits or ridges on the valve face. The finishing cut should be a light one. Careful machining may take a little longer, but the time saved in assembling would amply compensate for the extra care taken. In fitting a valve to its seat, it should first be tried to see if the face is true with the spindle, or if the spindle is bent. This can be done by rotating it in the socket of the cylinder head. If it should be found to be only slightly out of true, this may be often overcome by giving the back of the valve at A, a sharp blow, while it is in position in the head, as in Fig. II. By so doing, considerable labor will be saved when grinding in. There is a correct method of grinding a valve in. It is a mistake to give the valve a continuous rotary motion in one direction. Usually it will be found advisable to attach a crank or dog to the spindle (spindle being made long enough to allow for cutting a portion off the end, where the dog screw has been screwed down as shown at B in Fig. II.). The valve should be kept well to the seat, with the left hand pressing on the back of the valve, while with the right a semi-turn is taken, say 200 degrees, then lift the valve off the seat, rotate about another 60 degrees, and then return the valve to seat again and rotate as before. It will be found that, with this intermittent motion, a valve can be truly seated in half the time it would require with a purely continuous rotary motion. Care should be taken not to press too heavily on the back of the valve with the left hand, as you are apt to spring the valve to the seat and when pressure is removed, the valve will assume a different set in relation to its seat. This can readily be observed by pouring gasolene round the valve. You will find that as long as considerable pressure is applied to the back of the valve, it holds the gasolene without a leak. But as soon as this pressure is reduced (say to the tension of the spring, which would be used with the valve), the valve will be found to leak, showing that it had only been sprung into position by the pressure exerted and not truly a working tight fit.

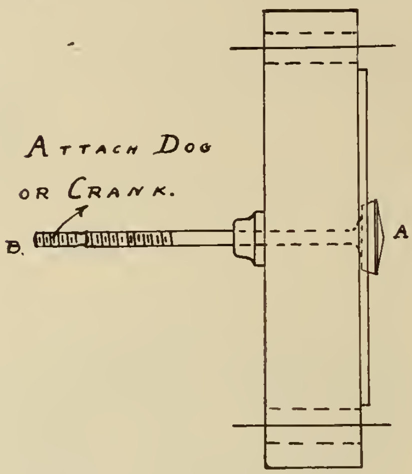


Fig. 2—Gas Engine Valves.

It is well, from time to time, to resmear the emery and oil well over the face of the valve. No. 1 emery powder or even coarser may be used to commence with, but the valve should be finished with a fine powder. Care should be taken to avoid the presence of large pieces of grit in the emery powder, as they are apt to give trouble by digging into either the seat or the valve face. A bearing surface of about 1-16 in. to 1-8 in. is about the amount necessary to ensure a good tight working valve. Often you will meet with a valve that bears all round, with the exception of a very small portion of the surface. This is caused by the tool jarring or springing in the operation of machining the valve, and often requires prolonged grinding to get the necessary bearing surface.

The valves can be tested with gasolene as regards being a tight fit. It is generally found that if they will hold the gasolene without leaking they work quite satisfactorily in actual use.

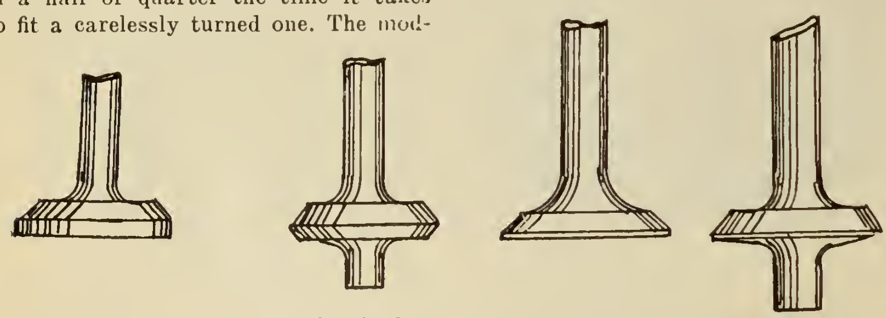


Fig. 1—Gas Engine Valves.

TURNING INTERNAL OR EXTERNAL OVALS.

By J. H. R.

The accompanying illustration shows a lathe chuck used for turning ovals either internal or external, such as punches and dies for oval fish can dies and similar work.

A side and front elevation of the chuck is shown in position on the lathe.

Fig. 1 is a cast iron support bolted to the bed of the lathe just in front of the head stock as shown at A in the elevation. This piece, Fig. 1, carries the adjustable piece, Fig. 2, which is moved and adjusted for the different shapes of ovals, and fastened securely by cap

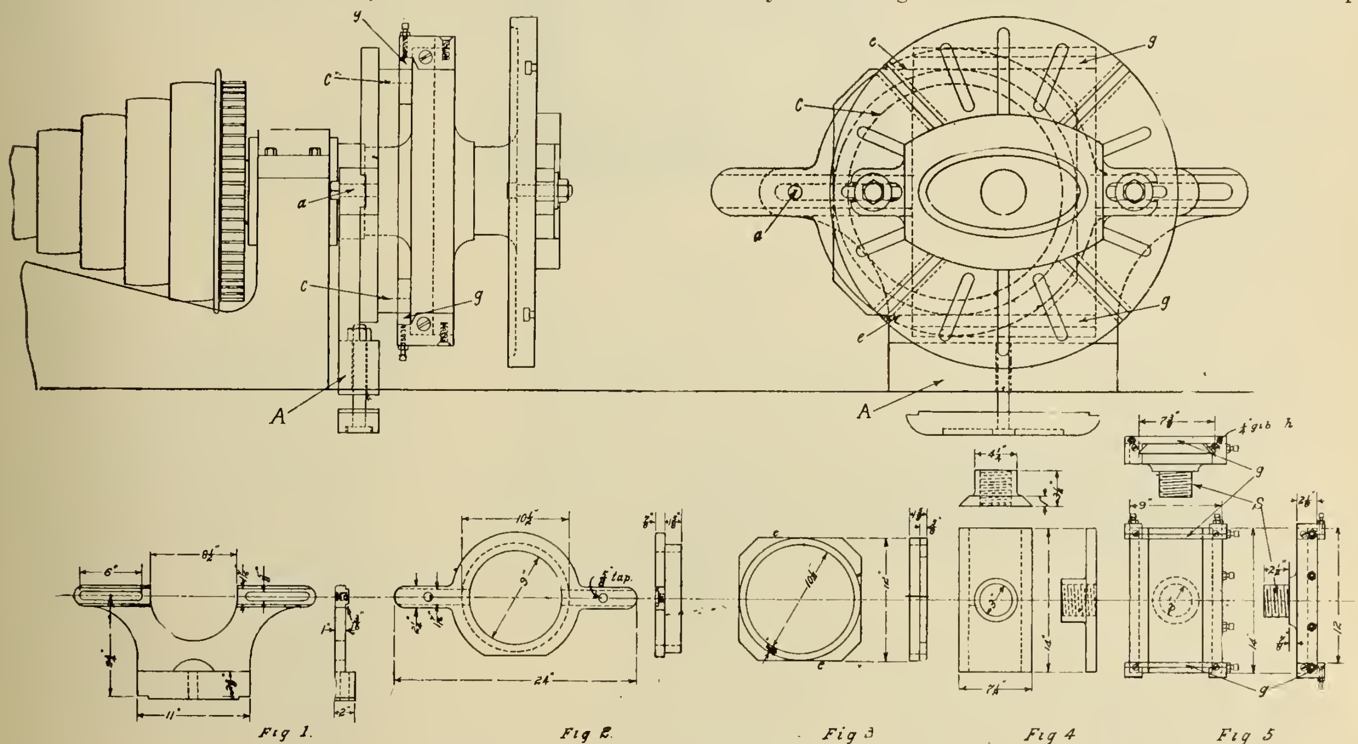
screws in the holes (a a), as shown at B in elevation.

Fig. 3 is a brass bush bored to a close fit for Fig. 2, shown at (c) in elevation. The edges (e e) are planed parallel to fit closely between the gibs (g g) (on Fig. 5) allowing free motion as the spindle revolves.

Fig. 4 is a cast iron piece which screws on to the spindle of the lathe and planed on the sides to fit the dovetail planed in Fig. 5, the gib (n) being used to regulate the friction.

Fig. 5 is a cast iron piece which fits closely on Fig. 4, and has a stem projecting out on the opposite side similar to the one on the spindle to carry the chucks and face plates belonging to the lathe.

Care should be taken when fitting stem S so as to bring the jaws of the chuck or the slots in the face plate in a central position with the rest of the chuck as it makes it more convenient when setting up work.



Turning Internal and External Ovals.

A COMPOSITE GUIDING STAR.

By H. F. Frohman.*

Success in any vocation lies not only in study, in continuous work, but in watching the achievements of successful men. Studying their ways, manners and ideas as they promulgate for their own welfare may possibly give the young man the right clew to his own advancement. Their advice (remember, advice is always cheap) is not so sure a guide as their own acts.

This idea has been the basis of whatever success I have achieved. To help me over the problems and difficulties and trials that all men must encounter, my plan has always been to pick from the motley crowd one merchant and follow his methods wherever they are applicable to my business and, if possible, improve upon them, make them suit the peculiarities of my line.

But I have found it hard to pick one who will answer all contingencies, all emergencies, one who might be called an "ideal." My ideal—my guiding star—has, preforce, been a composite one.

For instance. I know a man whose success has been attained by advertising and publicity. I make it a rule to watch closely the methods, movements and developments of this man; and when possible keep in touch with him by personal touch and correspondence.

I have in mind another whose personal methods greatly interest me. And still another who is an expert in cost system, factory methods, records. And so on all through the commercial world I specifically pick out the best men and concerns in each particular department of business, keep in touch with and study their methods, and, when practicable, apply them to my organization.

Especially inviting is this plan from the fact that in making the acquaintance of these men, one is entering upon a most fascinating, a most important game—the study of human nature.

I endeavor to meet these men either by introduction through a mutual friend or by presenting myself. Knowing each individual hobby, be it advertising or office methods or shop systems, I post myself as to his particular branch so as to properly correspond or converse with him, and try to view conditions from his standpoint. After agreeing with him, so far as is consistent, I start an argument in which many of his good points will be brought out. And such ideas as have been successful in his line will, no doubt, prove beneficial to me as well as others.

Wherever and whenever possible throw yourself in contact with men who hold responsible positions in your community, those who have made a success of their vocation. By showing your interest in them it's bound to be reciprocated; and before many days go by, in fact, almost before you realize it, those same men, whose acquaintance you have sought, will be attracted to you and your work perhaps as much as you have been to theirs.

To know these successful merchants, meet them on the highways, dine with them when you can at the same chophouse, better still meet them at their clubs—is an influence bound to quicken your energy, encourage your originality, make you a broader and more creative business man.

And it is worth the employer's while to attempt to get this spirit of studying the methods and ways of the superior into his own organization. I impress this idea upon all our people as soon as they reach places of responsibility. I have noticed that almost all have adopted our methods, with the result that we have a large, well-organized force, the several factories and officers of which pull together toward one end.—System.

* General manager of the S. Obermayer Company.

DEVELOPMENTS IN MACHINERY

New Machinery for Machine Shop, Foundry, Pattern Shop, Planing Mill; New Engines, Boilers, Electrical Machinery, Transmission Devices.

NEW GAP ENGINE LATHE.

Accompanying is an illustration of a new extension gap lathe made by the Barnes Drill Co., Rockford, Ill.

The important feature of this lathe is the sliding top bed which permits the width of the gap to be varied to suit the requirements of the work, and it increases not only the swing of the lathe, but also increases the distance between centres.

The advantages of the sliding extension feature over the common stationary gap lathe are easily seen. This lathe has the necessary strength and power to turn full diameter of swing in the gap, and at the same time it is free from any awkward or objectionable features for use on ordinary work.

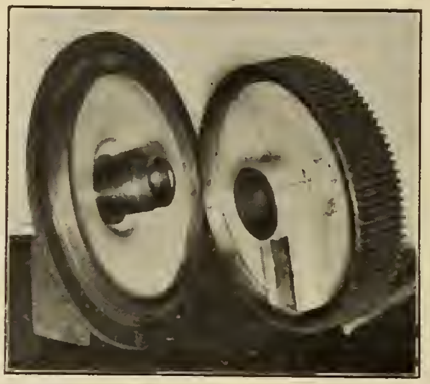
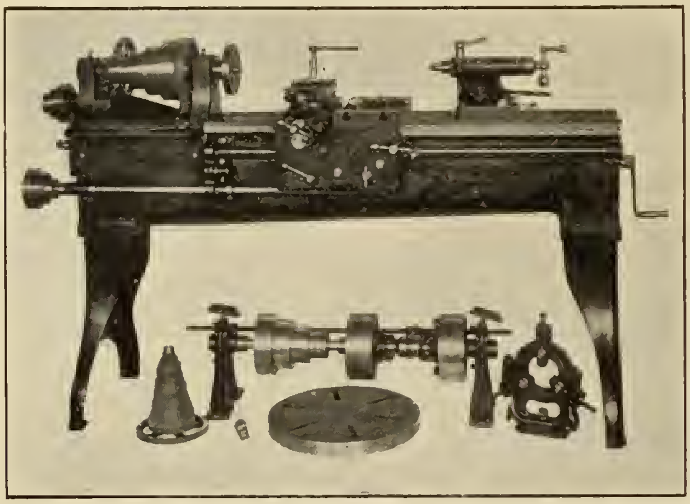


Fig. 1—Stockbridge Shaper Driving Mechanism.



New Gap Engine Lathe.

THE STOCKBRIDGE SHAPER & DRIVING MECHANISM.

The illustrations show method by which the Stockbridge Machine Co. support the driving mechanism on Stockbridge Shapers. The construction is different from the ordinary construction of driving gear and crank. With the ordinary construction, the gear is held from central hub entirely. The strain put upon this hub on the large size shapers, when out on their full stroke, tends to buckle the gear and oftentimes breaks the gear at the hub. Anyway the buckle in gear communicates an unevenness of stroke to the ram, which results in a chatter.

Applications have been made by the Stockbridge Machine Co. for patents on construction illustrated.

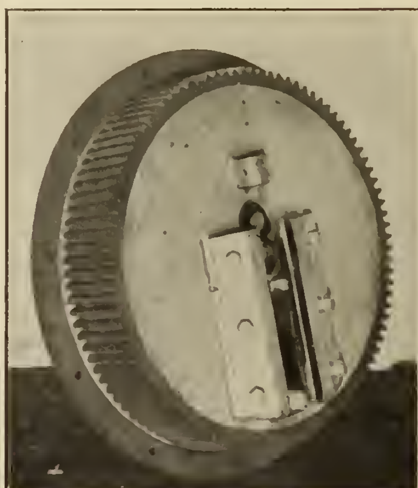


Fig. 2—Stockbridge Shaper Driving Mechanism.

Fig. 1 shows gear and main bearing. The main bearing has a flange which is turned to a running fit in the overhang of the periphery of the gear, the flange bottoming on the gear casting and making a support for the gear, relieving all strain from central hub, and preventing all possibility of buckle in gear, and insuring a smooth and even cut, regardless of the length of the ram stroke. This construction adds considerably to the stiffness of driving mechanism, and makes possible a much heavier cut than would be possible if the gear were not supported in this way.

Fig. 2 shows parts assembled. When main bearing is bolted to column, this becomes an integral part of shaper.

New Stepped Style Cutter.

NEW "STEPPED STYLE" CUTTER.

Some five or six years ago Messrs. Gould & Eberhardt, Newark, N.J., brought out what they term their stepped style of stocking cutter for roughing out the teeth of coarse pitch gearing, preparatory to finishing same with a standard finishing cutter. The advantages claimed over the ordinary square saw or slotting cutter which had previously been used most generally, was that by having the steps in the cutter, the chips were broken up, and consequently less power was consumed and

the strain on the machine and parts was not so great as with the old style of cutter, the principle of which produces a long shearing cut, with its incidental disadvantages. Again, the lower step of the cutter takes away the wide flank of the gear tooth space, which the square stocking or slotting cutter did not do, and in this way it left a more nearly uniform amount of

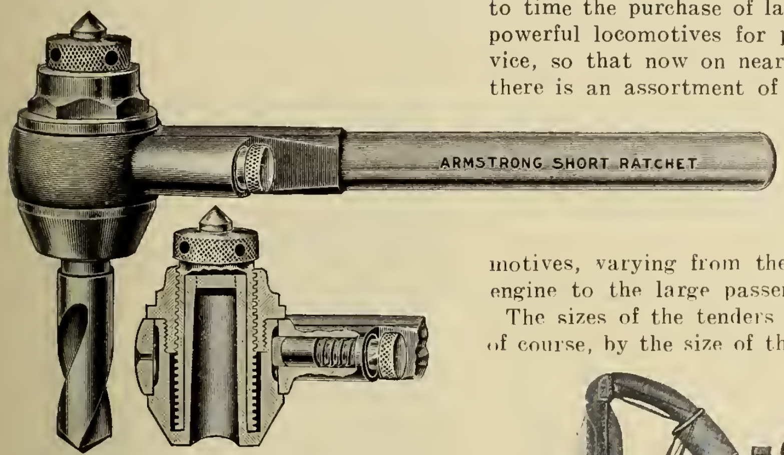


Fig. 1—New Short Ratchet Drill.

metal all around for the finishing cutter to take out.

Since that time they have still further improved the cutter, and recently brought out and patented the new "Stepped Style" of stocking cutter, as shown in the accompanying illustration. The essential feature of difference over the former style of stepped cutter is the recessing of the tops of the cutting teeth, so that each tooth practically takes out about half as much as the old style cutter. The new stocking cutter also finishes the bottom of the tooth space, thereby relieving the finshing cutter of this duty, and saves the latter where it usually wears out first.

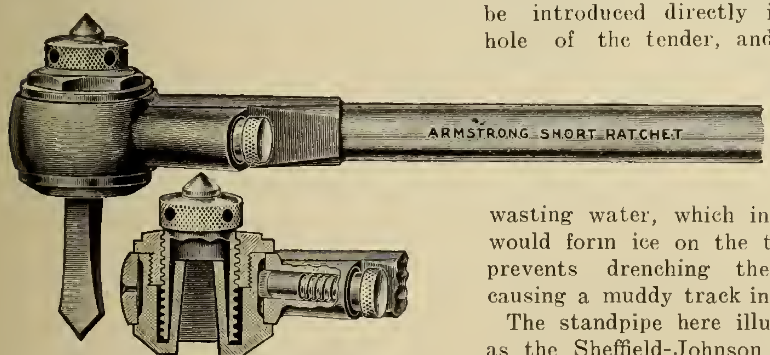


Fig. 2—New Short Ratchet Drill.

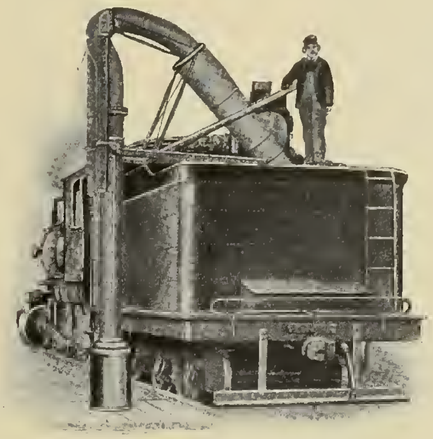
SHORT RACHET DRILLS.

The accompanying illustrations are of two styles of short ratchet drills just brought out by Armstrong Bros. Co., Chicago. Fig. 1 shows a sectional view of style R. All parts are made from drop forgings or bar steel. Pawl and centre are tool steel, carefully tempered. It is self discharging and can be reversed instantly. Fig. 2 is the shortest ratchet drill made. It is specially adapted as a boiler ratchet. In regard to construction the same remarks apply as to Fig. 1.

NEW RAILROAD WATER COLUMN.

The demand of the public for quick transportation and the competitive efforts of the railroads to satisfy the demand, has made necessary from time to time the purchase of larger and more powerful locomotives for passenger service, so that now on nearly every road there is an assortment of sizes of locomotives, varying from the small switch engine to the large passenger type.

The sizes of the tenders are governed, of course, by the size of the locomotive,



New Railroad Water Column.

so that a successful device for supplying water to these tenders must necessarily have a wide range of vertical movement in the spout to enable it to be introduced directly into the manhole of the tender, and thus prevent wasting water, which in cold weather, would form ice on the track. It also prevents drenching the operator and causing a muddy track in mild weather.

The standpipe here illustrated, known as the Sheffield-Johnson standpipe, and handled by the Canadian Fairbanks Co., with offices in Montreal, Toronto and Winnipeg, is simple and has a spout with a large range of vertical movement. From the highest point to the lowest, this spout has a sweep of five feet. No special description of details of construction is necessary, as it is so simple that a glance at the cut will show plainly how the flexibility is accomplished.

In connection with the above spout is used the famous Sheffield horizontal valve with relief valve, so that the combination makes the ideal standpipe. Railroad officials interested in the water service department, ought to look into the merits of this device.

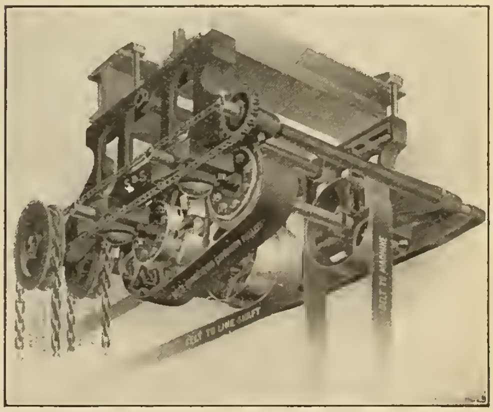
VARIABLE SPEED COUNTERSHAFT

This valuable speed countershaft shown in accompanying illustration consists of an arrangement of expanding belt operating pulleys by means of which any speed relationship desired within the limit of 4 to 1 can be obtained at a moment's notice.

The diameter of the expansion pulleys if effected as follows:

The run is divided into 12 sections with 2 spokes riveted to each. These spokes slide in machined slots inside a cast iron hub. Parts of each spoke inside the boss has teeth milled on one edge and all are in mesh with a broad pinion. This pinion is operated by an inner shaft which is only capable of longitudinal movement, but owing to grooves being milled on the one end of this inner shaft, any movement given to same rotates the aforesaid pinion inside the hub drawing the spokes in or forcing them out according to the direction of motion given to the hand wheel which operates both of these inner shafts simultaneously.

This countershaft is made by the Rotary File and Machine Co., 589 Kent Avenue, Brooklyn, N.Y.



Variable Speed Countershaft.

A NEW COMBINATION BAND, RIP AND EDGING SAW.

The accompanying illustration shows a new combination band rip and edging saw. For edging, the table is provided with a traveling chain under the outfeeding roll, as shown in illustration, and is operated by a sprocket chain and gearing from the same shaft that runs the upper feed rolls. This traveling chain has a vertical adjustment and can be quickly dropped below the sur-

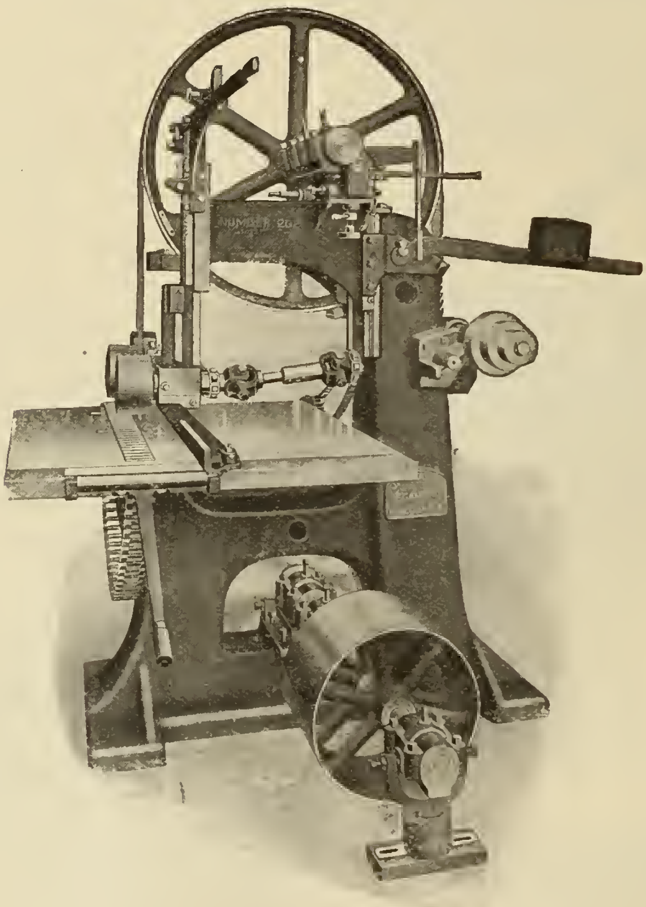
face of the table to be out of the way for ripping.

The column is very heavy, cored and perfectly free from vibration. The distance between the fence and the saw blade will admit material up to 24 in. wide. The rolls may be raised to receive timber 12 in. thick. The table is of ample size, and has at the front a plainly stamped index. Idler rolls are fitted in the table to remove friction. A cam lever releases, moves and clamps the fence, accomplishing the adjustment of the fence more quickly than by any other means yet devised.

The wheels are 42 in. in diameter, entirely of iron and steel, with spokes. The lower, heavy and with solid web, instantly, adding wonderfully to the perfect working of the machine and the life of the saw blade.

The saw guides are the latest improved pattern with sectional hardwood blocks arranged to permit of taking up the slightest wear and perfectly guiding the blade in the plane of the cut.

The feed is very powerful, the driven feeding-in and feeding-out rolls placed close together, enabling short stock to be worked to advantage. They are adjustable up and down instantly by means of the long lever above, convenient to the operator, or they may be raised from the board, instantly stopping the feed, or lifted quickly out of the way for use as a hand feed rip saw,



New Combination Band, Rip and Edging Saw.

circulating less dust and sustaining great momentum, so that its speed governs that of the upper, preventing the latter overrunning the former. The wheel shafts are of steel, extra heavy, running in extra long, self-oiling bearings.

The straining device (controlling the upper wheel and the path of the saw blade on the face of the wheels) is new and very sensitive, and has a forward, backward, and also a side adjustment. It is regulated by an adjustable weight and a compound lever so sensitive that no matter what the vibrations are the strain takes up the slack in the blade all of which may be accomplished by a single movement of the long lever. The feeding-out roll bearing is adjustable to take up the slack in the driving chain

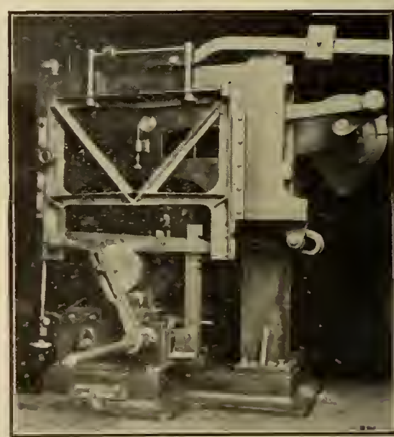
This saw is made by J. A. Fay & Egan Co., 362-382 W. Front St., Cincinnati.

ENGLISH HACK-SAW.

By Frank C. Perkins.

The accompanying illustration shows a unique hack sawing machine of English design, constructed at Milnrow, the power being supplied by a direct current or alternating motor mounted on the top of the machine. It may be stated that this machine cuts off circular blanks and tubes from five inches to ten inches in diameter and may be utilized also for sawing off round bars and beams six inches to ten inches.

The machine consists of a strong base plate upon which are mounted two uprights carrying the cross rail which carries the reciprocating slide carrying the saw. The saw frame is balanced and has a gravity feed, which may be adjusted by moving the balance weight along the balancing lever. The frame is



An English Electrically Driven Hack Sawing Machine.

guided in slides at both sides, which entirely obviates the spring resulting from being only held at one end as in the older types of machines. A stop is provided to prevent the saw frame falling after having cut through the bar.

It will be noted that the saw frame has reciprocating motion by connecting rod and crank along the cross rail and runs on rollers to eliminate the friction; and the bottom rollers have vertical adjustable to take up wear. The speed of driving wheel is 220 revolutions per minute. The driving gear is carried on two brackets bolted to the right hand shaft through 5.1 spur gearing. The bar when being sawn off is intermittently rotated against the saw by H. Liebert's patent revolving arrangement. This keeps the saw always cutting on the edge of a circle and enables blanks to be cut off when the saw reaches the centre.

CRUDE OIL METHOD OF WELDING ENGINE FRAMES.

In the St. Thomas shops of the M.C.R. is used a method of welding engine frames with crude oil, which has given excellent results. The method of doing this is as follows:

Placed between the parts of the frame to be welded is a "welding piece." A brick furnace is built up around the part to be welded, and the two parts are drawn together over the welding piece with hydraulic jacks. This is heated with an ordinary oil burner, and when correct condition has arrived, the pieces are hammered together.

Annual Convention of the Canadian Electrical Association

The Eighteenth Convention at Toronto Proves a Good One—Many Interesting Papers — New Officers — The Exhibits.

The eighteenth annual convention of the Canadian Electrical Association was held in the Chemistry and Mining Building of the University of Toronto on June 17, 18 and 19. There was a good attendance, and a successful convention was held.

Opening Session.

Ald. J. J. Graham welcomed the delegates on behalf of the city of Toronto, and President Falconer, of Toronto University, and Dr. Galbraith, of the School of Science, extended the freedom of the University to the visitors. Dr. Galbraith said that his only regret was that they had not been able to come while the school was in session.

"The more we can come into touch with the men who are doing the actual work, the better," he said.

The secretary-treasurer of the association, Mr. T. S. Young, reported an increase of 95 in the membership, and a total membership of 395. He said that the effort to get private power companies interested in the association had been successful. Last year only 70 private companies were represented; this year 92 were on the membership list.

He also pointed out in his report that no carbons had been manufactured in Canada for a number of years, and suggested that the association make an effort to have the present duty of 35 per cent. either abolished or greatly reduced.

The imports of carbons into Canada being abaut $40,000, this, Mr. Young claims, constitutes an unnecessary and unjust tax of $14,000 on the lighting companies.

An instructive address was given by Mr. W. N. Ryerson on "Power Rates, and Factors Which Influence Them." He recommended that as there had so far been no legislation in Canada regarding rates for electric light or power, it would be well for the members of the C. E. A. to be on the alert to forestall and prevent such legislation by so adjusting their rates of charging that no inequality or unfairness could be claimed. This subject had occasioned a wide diversity of opinion among the various companies, said Mr. Ryerson, but he thought this diversity was fast disappearing.

Afternoon Session, June 17.

A very interesting paper was read by Mr. C. H. Mitchell, descriptive of hydro-electric power plants inspected by him on his recent trip to Europe. The lecture was illustrated with a great number of slides from photos taken by Mr. Mitchell.

Mr. George Williams also contributed a paper on "Methods of Increasing the Station Load," which contained many hints on how to increase the number of users for electric light and power.

Morning Session, June 18.

"Modern Street Lighting" was a paper given by A. E. Fleming.

"For business streets, high candlepower units are without doubt the best, as the reflection from the buildings, assisted by the light from store fronts, signs, etc., enables us to place the units at greater distances apart. The general condition of a business street changes but little from time to time.

"For residence districts small units are desirable, and to obtain the best results they should be hung, as nearly as possible, over the centre of the streets.

"For suburban lighting, a medium-sized unit seems to be best adapted. Here we have large open spaces, with nothing to obstruct the lights; therefore the higher candlepower unit can be hung at greater height and farther apart."

Other papers were "Regulation of Electric Circuits or Currents," by W. G. Chase, and "Electric Light Earnings Per Capita," by W. A. Bucke.

Afternoon Session, June 18.

The business of the afternoon was largely the legal side of electric companies' work, two papers being given along this line, "Electric Franchises, Their Legal Status and Basis of Valuation," by Jas. Bicknell, and "Contracts," by Robert McKay.

A demonstration of the Electro-Metallurgical Apparatus at the University was given by Saul Dushman, iron ores being reduced to pig iron.

Election of Officers.

Officers for the ensuing year were elected as follows:

President, W. N. Ryerson, General Superintendent Ontario Power Company, Niagara Falls, Ont.

First Vice-President—R. M. Wilson, Montreal.

Second Vice-President—P. S. Coate, Chatham.

Secretary-Treasurer—Mr. T. S. Young, Toronto.

Managing Committee—Messrs. R. G. Black, Toronto; A. A. Dion, Ottawa; B. F. Reesor, Lindsay; Charles B. Hunt, London; J. J. Wright, Toronto; W. Williams, Sarnia; H. O. Fisk, Peterboro; J. W. Purcell, Walkerville; W. A. Pearson, Niagara Falls; R. S. Kelsch, Montreal.

Session on Friday, June 19.

"The Grounding of Transformers," was an interesting paper given by W. L. McFarlane. Mr. H. W. Price's talk on "The Oscillograph" was much appreciated. H. F. Strickland gave a paper, "The National Electric Code," telling of some of the difficulties of an electrical inspector.

A baseball match between the manufacturers and the operating men was the feature of the afternoon jaunt to Hanlan's Point.

Exhibitors and Exhibits.

The Canadian General Electric Co. exhibited flaming arc lamps, a mercury arc rectifier, a two ton electric hoist, some of their new Tungsten lamps, a line of electric heating and cooking apparatus, and a full line of electrical specialties. Their electric horseback exerciser created a good deal of amusement and interest. To illustrate the use of the electric motor in household economy, they exhibited a motor-driven sewing machine.

The Canadian Westinghouse Co. had quite a big exhibit, Nernst lamps, a full line of integrating wattmeters, volt meters and ammeters, a lightning arrester, a line of portable instruments, circuit breakers, the Cooper-Hewitt mercury vapor lamp, fan motors and small power motors. A feature of their exhibit was a Westinghouse metallic flame arc lamp. They also showed a motor-driven washing machine.

The Gas & Electric Power Co. exhibited the Ferranti oil brake switches, the Ferranti wattmeters, for A. C. or D. C. with cyclometer dial, a switchboard of volt meters and ammeters, flaming arc lamps, circuit breakers, and samples of cable for different work. H. S. Dodd was in attendance.

Canadian Fairbanks Co. showed a full line of small Fairbanks-Morse motors.

Electrical Specialties, Ltd., 12-16 Shuter St., Toronto, showed a line of XCELL Canadian dry batteries, which they manufacture.

The Philip Carey Mfg. Co. exhibited their roofing, cement, and pipe cover-

ings, asbestos materials for different purposes. In attendance were O. A. Cole and H. E. Rowell.

Johner-Greene Co., Stair Bldg., Toronto, showed a line of electrical specialties for which they are agents, including the Anderson time switch.

J. F. B. Vandeleur were represented. They are Canadian agents for several English electrical firms.

The Oneida Communities, Oneida, N.Y., exhibited their chain for suspending arc lamps.

The Universal Manufacturing Co., Chicago, exhibited their Universal flat rate controller.

The Hamilton Anchor Co., Hamilton, exhibited a full line of Swan and Atlas anchors.

The Allis-Chalmers-Bullock Co., represented by John S. Maclean, distributed a catalogue on hydro-electric plants. The members of the association are also indebted to this company for the printed list of those registering—a very handy thing.

FINE PIECE OF PATTERN AND FOUNDRY WORK.

The accompanying illustration is of a piece of pattern and foundry work accomplished in the foundry of H. R. Ives Co., Montreal. The patterns were made under the supervision of H. Feneley, the pattern shop foreman. The foundry work was in charge of S. Woodhall, superintendent of foundry, who has had a great deal of experience in United States and Canada in architectural work.

The castings are about ¼-inch thick and the molds are skin-dried to bring out the corners and lines in the castings, an ordinary blow lamp being used in the process. The plates, one of which is shown in the illustration, are for the Bank of Toronto in Montreal. They are about 9 feet 6 inches long and the smallest weighs about 750 pounds, while the longest weighs nearly 1,200 pounds.

A Fine Piece of Pattern and Foundry Work.

PERSONAL MENTION.

Mr. Glassco, Jones & Glassco, Montreal, is on a business trip through Ontario visiting the various users of power and machinery.

* * *

R. J. Parke, consulting engineer, Toronto, is back from England. He has secured the Canadian agency for the Aluminium Corporation.

* * *

Harry Wray Weller, of Babcox & Wilcox; N. S. Reeder, jr., of the Canada Car Co., and John Watson, of John Watson & Son, have been admitted to membership of the Montreal Board of Trade.

* * *

Prof. H. O. Keay, of the mechanical engineering department, McGill University will succeed Prof. Morgan as head of the railway department. Mr. V. K. Smart will be professor of railway engineering.

* * *

W. H. Wiggs, proprietor of the Mechanics Supply Co., Quebec, is managing director of the Tented City at Quebec. They are arranging to lodge and feed from 3,000 to 5,000 people per day during the Tercentenary Celebration from 20 to 31st.

Mr. Jones, Jones & Glassco, Montreal, has just returned from a business trip to England. He found there a great interest taken in all Canadian matters and the firms there are waking up to the fact that they are missing something by not cultivating the Canadian market more carefully. He has arranged with a number of manufacturers there so that his firm can give immediate prices landed in Canada on all ordinary classes of machinery and can furnish prices and information on special equipment for chemical works, oil, paint and varnish factories, sugar refineries, mill supplies, etc. A number of firms they represent are sending out partners to make a study of Canadian requirements.

T. E. Ryder, manager transmission department of Canadian Fairbanks Montreal, has been appointed manager of their St. John, N.B. house and is now in charge. The new appointment offers a wide field in the lines handled by the Canadian Fairbanks, particularly gas engines, scales and mill supplies.

PRESENTATION TO DAVID REED.

David Reed, who has been foundry superintendent of the Canadian Westinghouse Co., Hamilton, since the plant was built, received a very handsome presentation from his friends in the Westinghouse plant upon his resigning his position with the Westinghouse Co. to look after his interests in the Reed Foundry and Machine Co., Ingersoll, where the Reed molding machine will be made. The presentation consisted of a very handsome black sealskin suit case and toilet outfit, as well as a beautiful cut glass fruit dish with silver stand to Mrs. Reed. The presentation was made by a committee of seven from the different departments of the works at Mr. Reed's house, Friday evening, May 15.

HIS REMAINS.

A man returned to his native Indiana village after having emigrated to Kansas, some twenty years previous.

He asked about different ones he had known in the old days and finally of old Nicodemus Bainbridge, the town drunkard of his time.

"Oh, he's dead," replied the one questioned.

"Well, well, dead and buried, is he?"

"Nope, they didn't bury him."

"Didn't bury him!" exclaimed the former resident. "Well, then, what did they do with his remains?"

"Oh, they just poured them back into the jug."—The Silent Partner.

Convention of American Foundrymen's Association in Toronto

Greatest Convention in History of Association—L. L. Anthes, Toronto, President for Next Year—Papers and Discussion—Allied Orgnizations—The Exhibits

BIGGEST and best are the words which are characteristic of the convention of the American Foundrymen's Association, held in Toronto June 8-13. Last year at Philadelphia when an invitation was extended to the A.F.A. and to the allied associations to hold their next convention in Toronto, few had any idea of the facilities in Toronto for making such a convention a success, but now they have seen for themselves, and leave with great praises for Toronto as a convention city. Very great credit is due to the local committee and Canadian foundrymen who have taken an interest in the convention for the able manner in which the different features of the convention were handled. We owe a debt of gratitude to the Canadian Manufacturers' Association and to the city of Toronto for their co-operation in making the convention a success.

In point of attendance this convention is ahead of all others. Never before have the Foundry Supply Association had such buildings in which to make their exhibits; and never before has there been such a representation of operating exhibits. Both in tonnage and in floor space occupied the exhibits this year excel those at Philadelphia.

The four associations, the American Foundrymen's Association, the American Brass Founders' Association, the Associated Foundry Foremen, and the Foundry Supply Association, were all associated in this convention. Each association held its business meetings; the first two associations held their educational sessions; and all took advantage of the exhibits made by the Foundry Supply Association and the entertainment features.

The American Foundrymen's Association is an international organization, "American" being used in the broadest sense of the word. It has done wonderful work in placing foundry practice on a scientific basis. Canadian foundrymen should take advantage of this association. The election of a Canadian president in L. L. Anthes should result in Canadian foundrymen taking a live interest in the association, and thus helping on the great work which this association has in hand. This year will probably see a very large increase in Canadian membership.

A feature of the convention this year has been the great amount of useful discussion which has been brought out. This was the aim of the president and the secretary. The papers were arranged and delivered in such a manner as to provoke discussion. The quiet, cool building in which the sessions were held also did its share towards making this feature a success. The papers were short and most of them suggested points for discussion. For instance, the paper by E. H. Mumford, on molding machines, consisted of a series of questions, bring-

L. L. Anthes, Toronto Foundry Co., President of American Foundrymen's Association.

ing up all questions in regard to molding machines which could be discussed to advantage.

OPENING SESSION, TUESDAY AFTERNOON.

With the band of the 48th Highlanders in attendance, with the president, Stanley G. Flagg in the chair, the convention was formally opened with an address of welcome from Mayor Oliver, of Toronto.

This address was responded to briefly by E. H. Mumford, president Foundry Supply Association; by Chas. J. Caley, president of the American Brass Founders' Association; and by W. S. McQuillan, newly-elected president of the Associated Foundry Foremen.

The President's Address.

Mr. Flagg then delivered his presidential address, speaking on the lines to be followed in the development of the association.

He touched on the value of membership in the association because of the technical knowledge which a man could gain thereby, and because of the social side. The making of new acquaintances and the developing of friendships he considered of great value. He spoke of the value of the literature published by the association; of the debt that general foundry practice owes the association because of this. He pointed out

R. J. Cluff, King Radiator Co., Toronto, Vice-President American Foundrymen's Association.

that, although the association's proceedings contained page after page of ultimate, careful analyses, we had not as yet learned exactly what these meant—we did not know what to do with them. He believed that the development in

Dr. Moldenke's Welcoming Smile.

the future would be along this line of approximate analysis.

The development in the future will depend, the president said, upon the practical use to which the vast amount of technical information which is stored up in technical journals, and he made a plea that this data be put to more practical use than was done ordinarily.

Report of Secretary.

The secretary's report showed a year of excellent work for the association. The most important part of his report was in regard to the research work which was being carried on. Some of this work had been taken up and completed. Other lines of research work are being carried on at the present time. Over $800 had been raised as a special fund for the carrying on of this work.

Civic Reception Tuesday Evening.

A very enjoyable, informal reception was tendered the visiting foundrymen by the city at the City Hall on Tuesday evening. Mayor Oliver and Mrs. Oliver received in the reception chamber, which was handsomely decorated with flowers. Two orchestras furnished excellent music. Refreshments were served in the main hall. Everyone enjoyed themselves in one way or another, the younger people in dancing, and the others in social intercourse. The beauties of the hall, the excellent music, and the willingness of the people to be entertained, all contributed to make the affair a marked success. "The finest thing we have ever had of this kind," remarked Dr. Moldenke.

WEDNESDAY MORNING

This session was devoted entirely to the discussion on the construction of automobile cylinders and moldiig machine practice.

Construction of Automobile Cylinders.

A paper on "Production of Automobile Cylinders" by L. N. Perrault, Waterbury, Conn., was read by the secretary, and there followed upon this a very technical discussion on the composition of the iron for automobile cylinders, and the effect of various constituents upon the strength, a long list of ultimate analyses being given in one discussion.

Mr. F. W. Stickle, Hartford, Conn., discussed the same question, producing more analyses, and one or two practical points were discussed.

Discussion of Molding Machines.

Mr. E. H. Mumford introduced this subject by putting before the association the series of questions, designed to bring out discussion, as follows:

1. Is there anything by which to appraise a molding machine other than the

President Flagg Holds Forth at Opening Session.

ratio of value of castings produced to cost of production?

2. When do portable molding machines pay better than stationary machines? Why?

3. When do stationary molding machines pay better than portable machines? Why?

Some of Those Attending the Convention of the American Foundrymen's Association at Toronto.

4. What part of the work of machine molding is getting sand to machines and getting the molds off the machines to the floor (a) in hand rammed or portable machines? and (b) in power rammed or stationary machines?

5. What increase of output is afforded stationary machines by power sand supply over that when sand is shovelled from the heap?

6. What increase of output is afforded stationary machines by immediate disposal of mold parts, so that the operator does not have to set and close his own work on the floor?

7. What does power sand supply cost per machine.

8. What does off-bearing of molds by off-bearers or power mold tables cost?

9. What is the limit of depth and the size of flask at which power-ramming by pressure ceases to pay?

10. What is the limit of depth and weight of mold at which jolt ramming ceases to pay?

The discussion, however, did not follow these questions very closely, but was started along the lines of the relation of the molding machine to the molder, and whether it were better for a firm to have molding machines operated by experienced molders, or to train machine men for it. There was very interesting and profitable discussion.

WEDNESDAY AFTERNOON SESSION

The first part of this session was taken up with a continuation of the discussion of the operation of molding machines. Some of the outstanding features of the discussion are as follows:

"We found there were just two things about molding machines to make them a success, one, getting the sand to the machine and taking the molds away from the machine, and the other pouring the molds off after they have been placed on the floor. We kept very accurate data in regard to the cost of those operations and how much that made to us in percentage ratio to the total value of the machine. The faces we had on the machine was an ordinary standard 4 inch. We put up 300 molds per day. For labor that included two men on the machine, a boy looking after the cores, and one man we had to handle the sand at $1 a day to the machine; then we had a man come in the afternoon to shake out the castings and wheel the

Some of the Souvenirs Distributed at the Convention.

sand back again. Our ordinary hand price for that particular job was 7c., whereas on the machine we made them for less than 3c. But the difficulty came when we could not get the sand, get the molds away from the machine, and get the castings poured off in anything like the ratio we had the molds made. We found in rough numbers the proportions of a day's work were about like this : Cooling of molds and forming constituted 50 per cent. of the total work; the pouring off, which included the cutting of the sand and carrying the castings to the mill, was 25 per cent., and the handling of the sand back to the machine and placing it in the machine amounted to 25 per cent."

Mr. Field Produced a Multiplicity of Resolutions on Friday.

A Regular Attendant at the A. F. A. Meetings.

Conveying the sand to the machine by conveyor was discussed fully and this statement was made that there are very good results obtained from small conveyors attached to small machines, and that if the total output be divided by the number of operators, the gain per man was very large.

Considerable trouble is had with the sand in some conveyors in that the character of the sand changed, and little pebbles formed which could not be broken up.

Some Other Papers.

A paper, "Annealing Castings," by W. M. Carr, was then reviewed by the secretary. Another paper, Specifications for Castings to be Annealed," by H. E. Diller, was discussed. A paper on "The Prevention of Accidents in the Foundry" was read by Thos. D. West, and

L. L. Anthes Upon Being Elected President of A. F. A.

was discussed shortly. Mr. Archie M. London's paper on "Core Making" was discussed pretty fully. W. M. Saunders was not present to present his paper on

Mr. F. W. Stickle on Automobile Cylinder Making.

"Ferro-Alloys in the Foundry." The paper "Titanium in Cast Iron," by Dr. Richard Moldenke, was read and discussed shortly. Mr. F. C. Everett read his paper on Foundry Warehouse Methods. The papers, "Pattern Making for the Specialty Shop," by H. M. Lane; "Foundry Transportation Methods," by David Gaehr, and "Oxy-Acetylene Welding of Castings," by G. H. Taylor, were not read or discussed. Mr. W. E. Olds, Toronto, did not turn up to give data concerning application of thermit brought up since last convention.

H. M. Lane Explains the Situation.

THE MOONLIGHT EXCURSION.

On Wednesday evening a very enjoyable excursion was given by the Canadian Manufacturers' Association by the steamship Cayuga. The boat made a trip out into the lake. The moon was kind, but the weather man was a little severe, with the result that people kept to the parlors. Music was furnished.

President Caley Makes up the Programme of Brass Association.

THURSDAY MORNING SESSION.

The group of papers presented at this session were to start general discussion on cupola practice. The first paper was "Cupola-Thermics," by S. H. Stupakoff, which was so technical that it was not discussed at the meeting. V. B. Lamb was not present to give further notes on sandless castings, and the secretary took up the question instead. He told of his experiences five years ago in casting couplers in iron molds and also brake shoes, which were tested at Perdue University, where it was said that there were none better. There followed very full discussion on this subject, especially as to the correct thickness of the iron mold, and the composition and character of the castings from these iron molds.

Mr. Jules de Clercy's paper "Chemical Reactions in Foundry Cupola Practice," was read by Mr. Black, and very full discussion followed. This cupola being on the grounds made the discussion most interesting and instructive.

W. E. Kanaval Follows Up His Sand.

THURSDAY AFTERNOON SESSION.

The paper by H. F. J. Porter on "Shop Management" was not read, but will appear in the transactions.

Mr. G. T. Long read his paper on "By-Product Foundry Coke," concerning which there was some discussion. "Foundry Waste" was read by Mr. Harrington Emerson, and discussion followed.

J. D. Stoddard, as the Artist Caught Him in His Booth.

Report of Committee on Costs.

The report of Kenneth Falconer, chairman of Cost Committee, was read as follows:

At the convention of this association in Philadelphia, May, 1907, the "Committee on Costs," as then constituted, was re-appointed for one year, with instructions to report at the next convention of the association.

The jobbing Founders' Association having appointed a committee to work along similar lines, it was deemed advisable that the committees of the two associations should work together.

E. H. Mumford Discusses Molding Machines.

During the past year several joint meetings of these committees were held: Mr. Stirling, of Hilles, Jones & Co., representing the Jobbing Founders' Association, and the American Foundrymen's Association being represented by Dr. Moldenke Mr. Harrington Emerson, Mr. E. M. Taylor and Mr. Kenneth Falconer.

Under date of November 27th, 1907, Mr. Stirling submitted to his association a report on "Uniform Cost Methods" for jobbing foundries, which we understand has been approved, and largely adopted by members of that association.

Your committee recognizes that it is impossible to lay down hard and fast rules regarding details of figuring costs, making estimates, and basing tenders,

E. H. Schwartz, Discussing Gyrating Flame Crucible Furnace.

but at the same time they feel that the best interests of the foundry business demand some degree of uniformity in the basic principles on which costs are figured. With this idea in mind the preparation of a chart outlining the main divisions of costs was delegated to Mr. Harrington Emerson, and the chart as prepared by Mr. Emerson is attached hereto.

Your committee desires it to be understood that they only endorse this chart for general use so far as main divisions are concerned; details to be arranged in each instance according to the requirements of individual plants.

F. N. Perkins, President-Elect of Foundry Supply Association, Telling About the "Modern" Molding Machine.

The final decision of the two committees was that to secure the best possible results certain clear-cut lines should be drawn, defining cost of product up to and including certain processes; but that further analysis of such costs should be in each instance left to the individual judgment of those in charge of the plants.

In view of the fact that in the majority of cases it is commercially impracticable to obtain record of the cost of individual castings, the accompanying chart was designed with the idea of dividing the foundry output into classes, the number of which would depend on conditions and circumstances; in the chart attached, the output is divided by Mr. Emerson into approximately ten classes.

J. N. Battenfeld Touches on Good Points of the "Berkshire."

The actual cost of foundry output has been divided, as will be seen by reference to the chart, into the following main divisions:

1. Metal.
2. Direct labor.
3. Indirect expenses chargeable on basis of weight and output.
4. Indirect expenses chargeable as a percentage of direct labor.

If those competing in the foundry industry for orders would base their figures on some such classification, subdivided to such detail as may be found advisable in individual cases, the result

would be of benefit to the entire trade, and would tend to eliminate the reckless competition to which is largely responsible the present unsatisfactory condition of the foundry business.

Mr. Kreuzpointner took up his paper "The Development of a Cost System for the Foundry," which was based on this report. This paper will be reproduced in an early issue of this paper.

Mr. Kreuzpointer took up his paper on Industrial Education, pointing out the great necessity for more industrial education, giving statistics showing how very much less there is than should be.

An illustrated address was then given by Professor Johnson on the work which is being done in foundry work at the Winona Institute in Indianapolis where an industrial school and workshop is being conducted on a commercial basis.

Dr. Moldenke delivered an address on core-making in the United States, after which the session adjourned.

Trolley Ride to Scarboro Beach.

Thursday evening the delegates were entertained with a trolley ride to Scarboro Beach, where the evening was spent in the amusement park.

THE CLOSING SESSION.

A Committee was appointed with Mr. West as chairman to take up the question of the prevention of accidents in the foundry.

A motion was passed requesting the incoming board to carefully consider the question of allowing the President and Secretary a proper amount to defray their expenses while at the convention.

Geo. H. Wadsworth Tells About His Core Machine.

A motion was passed that there be a referendum vote of the entire membership to decide the question of increasing the dues from $5 to $10, and that two-thirds majority of the total membership vote shall be necessary to pass it.

A motion was passed recommending the substitution of chemical analysis for the grading numbers as used in grading pig iron, and that the American Society of Testing Materials be requested to appoint a committee to confer with the committees of the different Foundry Associations interested in the subject, to take up the matter of specifications for buying pig iron materials.

The Two Slys Discussing a Good Prospect.

A resolution was passed that a vote

of thanks be extended to the civic authorities in Toronto, to the Canadian Manufacturers' Association, to the Canadian Reception Committee, the Toronto Reception Committee and to the Ladies' Committee, who have been so kind in entertaining the American Foundrymen's Association.

Mr. Stanley G. Flagg the retiring president was made an honorary member of the association.

Election of Officers.

The nomination committee presented their report, and it was adopted unanimously, and officers were elected as follows:

W. E. Olds on "Thermit" Welding.

President—L. L. Anthes, Toronto Foundry Co.

Secretary-Treasurer—Dr. Richard Moldenke.

Vice-Presidents—F. B. Fainworth, the Toronto Foundry Co.; Wm. H. Parry, National Meter Co., Brooklyn, N.Y.; J. W. Jeffry, Ohio Malleable Co.; Samuel T. Johnson, Chicago; J. W. Sheriff, Sheriff Mfg. Co., Milwaukee; J. W. Kissich, Columbus Iron Works; R. J. Cluff King Radiator Co., Toronto.

The Smoker.

The smoker was a great success. Every person enjoyed themselves. The tobacco was good, the iced water served tasted well, and the programme was entertaining. The band-leading contest made a hit, but best of all was the amateur boxing bout.

NOTES OF THE CONVENTION.

Photographer Galbraith had a goodly supply of clouds on hand on Thursday for the photograph of the A.F.A. group.

What about the formation of a Canadian Foundrymen's Association? There is ample evidence of the educational value of such organizations. Look what the American Foundrymen's Association has done for the foundry industry in the States. See the work accomplished by local organizations. Why should not the foundrymen in Canada be organized, as the New England foundrymen are, as the Pittsburg foundrymen are? Great things could be accomplished with such an organization.

* * *

Why should there not be more interest taken in the foundry foremen organizations in Canada? The Chicago foundry foremen have a very live organization. Great things are done. Their annual exhibit is only excelled in educational value by the big exhibit. There are educational possibilities in such organizations which should be realized by Canadian foundry foremen.

* * *

The American Foundrymen's Association now has 57 Canadian members, a gain of 40 since the last convention. There is no doubt that this number will be greatly augmented during the coming year.

* * *

Coke for use at the convention was furnished by the Solvay Process Co., Detroit, through their local agents, the Standard Fuel Co.

* * *

Next year the convention will go to Cincinnati; in 1910, to Detroit; and Pittsburg is after it for 1911. The association seems quite a popular guest.

Fleury on "Made in Canada" Goods.

E. J. Woodison Wears His Happy Smile and a Rose.

Rayner, of the Carborundum Co., Talks Grinding Wheels.

J. S. McCormick Keeps a Tight Grip on the Money Bags.

C. F. Hoyt, of the foundry department of the Lewis Institute, of Chicago,

C. F. Blake, Calumet Engineering Works.

secretary of the Chicago local Foundry Foremen's Association was honored by a few of his friends coming over to Toronto with him in the special Pullman with the presentation of a handsome coral and pearl tie pin, in appreciation of the trouble he had gone to in arranging for the trip. The presentation was made at the meeting of the foundry foremen on Monday night.

* * *

The Dominion Iron & Steel Co. furnished the pig iron for use at the convention. Molding sand was supplied by the Albany & North River Molding Sand Co., Albany, and the Interstate Sand Co., Cleveland.

Cummings and Peek and the Hats.

* * *

Here is something new. Did you ever learn of a cupola making molds? It was done Monday. The following clipping from a daily paper tells about it: "This company has a large foundry outside of Machinery Hall, including a cupola which runs off heats, and makes molds for the different exhibits in the

J. S. Robeson, on "Glutrin."

H. D. Harvey Sending Home Orders for Steele-Harvey Furnaces.

hall. In the building another company is using iron that is molded in the cupola, and is melting souvenir molds and castings. These are only a few of the interesting things to be seen at the convention."

The American visitors seemed delighted with the Exhibition Grounds.

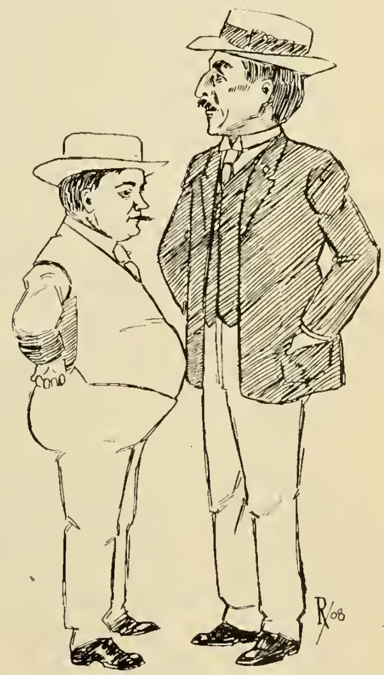
Canadian foundrymen are well represented on the new executive of the As-

David Reid on the Reid Molding Machine.

sociated Foundry Foremen. J. Gaffner, Montreal, 2nd vice-president; David Reed, district vice-president for Hamilton, and M. J. Walsh for Montreal.

* * *

The Robeson people, familiarly known as "Glutrin" producers, gave a dainty banquet to their foundry supply repre-



The "Deacon" and "Dougal," of the Detroit Foundry Supply Co.

sentatives in United States and Canada at the King Edward Monday night. "Glutrin' in gold letters adorned a most expensive menu and merriment reigned. Magnificent souvenirs were presented to each guest.

* * *

A "McCormick Roadster" is unique as an exhibit of foundry supplies, but

as a vehicle for a pleasant ride in the cool of the evening, it would be too much of a "bone-racker." In the languaget of a few years ago when bicycles were young, it would be known as an "ice wagon." J. S. McCormick must have sat up nights wondering what he would use as driving gear and chain.

* * *

A. B. Moffat, of Moffat Stove Co., Weston, near Toronto, closed down the plant on Tuesday afternoon and brought all his ment to the convention. Twenty-eight paid admissions resulted. A good broad-minded policy, a policy worthy of the man and the A.F.A.

* * *

Good music and in plenty, a splendid reception building, a crowd of people willing to be entertained adequate refreshments, all contributed to make the civic reception at the City Hall a most yable affair.

* * *

The "Daily Bulletin" was in great demand, and did good service in printing notices, etc. The bulletin service in the Process Building also did its share; but a megaphone is necessary to attract the attention of a great many people.

* * *

At one of the sessions of American Foundrymen's Association, during discussion of molding machines, a speaker rose. The chair wanted his name. Lemon. General laughter. As it cleared away, the speaker was heard to remark "This will not be a case of handing you a lemon."

* * *

The method of presentation of papers and provoking discussion adopted by the president and secretary of the A. F.A. at this convention was a great success. Excellent discussion was a fea-

Weaver and Johnston in Big 3 Booth.

ture of the sessions of the association at this convention.

* * *

A handsome presentation was made to the retiring secretary of the Associated Foundry Foremen, Mr. F. C. Everett, by members of the association. The presentation was in the form of gold, because of the duty that would have to be paid should a suitable present be taken back across the border.

Thompson in Hamilton Facing Mills Booth.

The Dairy building was a delightfully quiet and cool place for the meetings of the association. It was a haven in comparison with the meeting room at Philadelphia.

* * *

E. C. Gurney, Gurney Foundry Co., Toronto, his superintendent and 13 of his foremen, visited the exhibit buildings on one of the convention days. Each man was tagged with a "Gurney" badge.

* * *

A souveir which is not included in the group photo of souvenirs, but which was a unversal favorite, as it has been in former years, is the "Thermit" tie pin.

* * *

Hill & Griffith Co., Cincinnati, sent a handsome watch fob to those registering at their booth. It was in the form of an embossed plate of oxidized silver or, which was one of their small perforated foundry chaplets. It is very plain, no ad. appearing on the front. It is a souvenir worth keeping.

* * *

The Carborundum Co., Niagara Falls, N.Y., sent a box of carborundum crystal to those signing their register.

QUESTIONS AND ANSWERS.

Windmill Power.

Ques.—How do you figure the horse-power transmitted by a windmill?

Ans.—

V=velocity of wind in feet per second.

A=total area of sails in square feet.

N=Number of sails.

$$A = \frac{1080000}{V^2} \text{ H. P.}$$

$$\text{H.P.} = \frac{A V^2}{1080000}$$

Speeds of Emery Wheels and Grind Stones.

Ques.—At what speeds should emery wheels and grind stones be run?

Ans.—Soft, coarse grain emery wheels can be run faster than fine, hard wheels. An average peripheral speed is 5,000 ft. per minute. For a soft tool grinding wheel with a water supply the peripheral velocity should not exceed 3,000 feet per minnte.

The peripheral velocity of a grind stone averages 800 to 1,000 ft. per minute, though it may safely reach 3,000 feet.

Clearance Between Punch and Die.

Ques.—What difference should there be in the sizes of the punch and die to prevent the punchings from sticking in the die and sometimes breaking it?

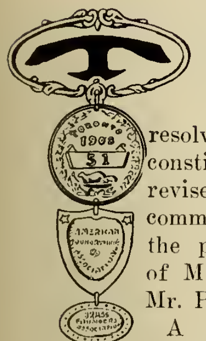
Ans.—A common rule is to make the size of the die-hole equal to the size of the punch plus one-fifth of the thickness of the plate to be punched. If

Merrick, of Merrick Foundry Supply, and the "Hauck" Burner.

D=diameter of die-hole, d=diameter of punch and t=thickness of the plate, then $D=d+.2$ t. For punching thick plates this rule is not closely followed, the die-hole being made smaller than the size called for by this rule.

The Proceedings of the American Brass Founders' Association

Officers for the Ensuing Year—Report of the Various Sessions—Some Valuable and Instructive Papers — Remodeling of Constitution.



THE opening session of this association was on Wednesday morning, June 10. It was resolved that a committee on constitution be appointed to revise the constitution. This committee was appointed by the president, and consisted of Mr. Webster, Mr. Allan, Mr. Patch and Mr. Fairlie.

A nominating committee was appointed, consisting of Mr. Abate, Mr. Corse and Mr. Gamble.

Some of the Papers.

The papers on Wednesday included: "Electro-Chemical Cleaning Baths and Application to Commercial Purposes," by Chas. H. Procter, upon which there was very considerable discussion; "How to Use Your Membership Privileges," by A. M. Fairlee, which was well received; "The Outside versus the Inside Man," by W. A. Porter, Toronto, which is both clever and to the point, although having no special significance as far as brass founders are concerned.

Some of the papers on Thursday were: "Prolonging the Life of a Crucible," by Dudley A. Johnson, which is a subject of great interest to brass founders, and then was some discussion; "Metallurgy of the Bronze Age in Europe," by W. M. Corse; "The Relation Between the Physical and Chemical Characters of Molding Sand," by Dr. Heinrich Ries, read by the Secretary; "Quality vs. Quantity," by J. N. Gamble, upon which there was some discussion.

Election of Officers.

The Friday morning session was given up to the consideration of unfinished business and election of officers. The report of the committee on constitution was submitted and adopted as a whole. The new constitution is to be printed and mailed to members.

The report of the nominating committee was adopted and officers were elected, as follows:

President, Charles J. Caley, Russel & Erwin Mfg. Co., New Britain, Conn.; secretary, W.M. Corse, Detroit Lubricator Co., Detroit, and treasurer, John H. Sheeler, Sheeler-Hemsher Co., Philadelphia.

The vice-presidents are: Wm. R. Webster, Bridgeport Brass Co., Bridgeport, Conn.; W. C. Allen, Yale & Towne Mfg. Co., Stamford, Conn.; Thomas Evans, J. Cessna Sharpe, Chattanooga, Tenn.; Chas. B. Bohn, Allyne Brass Foundry Co., Detroit; W. D. Allen, W. D. Allen Mfg. Co., Chicago; J. N. Gamble, Western Tool Co., Kewanee, Ill.; W. L. Abate, Nathan Mfg. Co., New York; N. K. B. Patch, Lumen Bearing Co., Toronto, Ont., and Richard R. Mitchell, Montreal, Que.

Mr. Corse, the new secretary, is also president of the Detroit Foundrymen's Association, as well as president of the Society of Detroit Chemists.

Chas. J. Caley, Re-elected President of American Brass Founders' Association.

THE VALUE OF LIQUID FUEL IN BRASS FOUNDRY PRACTICE.*

By W. N. Best.

As this is an age which demands from every modern brass foundry not only quality of output, but also quantity, liquid fuel naturally appeals to every foundryman because it contains a higher calorific value than either coal or coke and with it any degree of heat desired can easily be attained and maintained at the will of the melter. To prove this statement we will first consider the chemical analysis of oil, tar and denatured alcohol as well as of coal and coke:

Beaumont (Texas Crude Oil—

Carbon	84,60%
Hydrogen	10.60%
Sulphur	1.63%
Oxygen	2.87%
Calorific value per lb.	19,060 B.T.U.
Gravity at 60° F.	21° Baume
Weight per gallon	7½ lbs.
Calorific value per gallon	142,950 B.T.U.

Residuum Oils (average)—

Carbon	84.35%
Hydrogen	11.33%
Nitrogen	.60%
Sulphur	.90%
Oxygen	2.82%

Calorific value per lb. varies from 18,-350 to 19,342 B.T.U.

Gravity varies from 26° to 28° Baume.

Weight, per gallon, 7 lbs.

Average Calorific value per gallon, 142 500 B.T.U.

Coal Tars (average)—

	Dominion Coal.	London Tar.
Carbon	81.50%	77.53%
Hydrogen	5.68%	6.33%
Nitrogen	......	1.03%
Oxygen	12.45%	14.50%
Sulphur	.37%	.61%

Calorific value per lb.	16,260 B.T.U.
Weight, per gallon	10 lbs.
Calorific value per gallon	162,600 B.T.U.

Denaturized Alchohol—1 lb. alcohol (C_2H_6O) contains—

Carbon	.522 lb.
Hydrogen	.130 lb.
Oxygen	.348 lb.
Calorific value per lb.	13,140 B.T.U.
Weight, per gallon	5.7 lbs.
Calorific value, per gallon	74,900 B.T.U.

Pocahontas Coal (average run of mine)—

Carbon	82.26%
Hydrogen	3.89%
Oxygen	4.12%
Nitrogen	.64%
Sulphur	.49%
Ash	8.60%

Calorific value per lb.... 15,391 B.T.U.

Bituminous Coal (Pittsburg)—

Calorific value per lb.... 12,141 B.T.U.

Bituminous Coal (Illinois)—

Calorific value per lb. ... 10,506 B.T.U.

Anthracite Coal—

Calorific value per lb.... 13,189 B.T.U.

Coke—

Calorific value per lb..... 13,000 B.T.U.

* Presented before American Brass Founders' Association.

View of Canadian Machinery Booth.

The success obtained from the use of liquid fuel depends largely upon the hydro-carbon burner used. There are possibly thousands of different burners upon the market to-day, of which the majority are of the internal mixing or injector type. In these the fuel and the atomizing agent flow out in the same direction. In another type of burner, known as an external mixer, the fuel flows down upon a sheet of steam or air and is thus carried into the furnace or fire-box of boilers. It can readily be seen that in neither of these two types of burners is the fuel broken into particles or thoroughly pulverized by the atomizing agent. We are aware that the more volatile fuels require very little atomization but if the burner used is not of such form and capacity as to insure the thorough atomization of any grade of liquid fuel, the foundryman will be in a sad predicament whenever a shipment of low grade fuel is sent him. I always recommend an external mixing burner having the fuel orifice below the atomizer cavity, as this prevents the fuel from solidifying or carbonizing over the atomizer slot; and as the fuel passes out of the nose of the burner in a perpendicular manner, while the atomizing agent passes out horizontally, the thorough pulverization or atomization of the fuel as well as the even distribution of the flame in the combustion chamber is effected.

As crude oil is of two varieties, the one having asphaltum base, the other paraffine base, and as tar often contains lamp-black, I always recommend the use of a special regulating cock, which insures both a steady flow of fuel to the burner and the minute regulation of quantity of same. The plug of this regulating cock has a V-shaped knife-edged opening on the intake side, while the exit has a large opening, and thus the residuum which may be in the fuel cannot stop the flow. If a globe or needle valve be used to regulate the fuel supply to burner, the space that the valve parts from the valve-seat is so slight that the residuum in the fuel soon collects therein, causing great annoyance. This is especially noticed when low gravity fuels are used, for then often the valves become so clogged that the supply of fuel is entirely cut off.

Theoretically, it requires 13½ to 14½ lbs. of air to effect the perfect combustion of 1 lb. of oil. Allowing 14 lbs., at 62° F., it would require 184.97 cu. ft. of air to effect the perfect combustion of 1 lb. of oil, or at 100° F. it would require 197.34 cu. ft. In actual practice it has been found that it requires from 17½ to 19½ lbs. of air to effect the perfect combustion of 1 lb. of oil, and allowing 19 lbs., at 62° F., 249.68 cu. ft. are required, or, at 100° F., 267.82 cu. ft. Considering 1 gallon of oil to weigh 7½ lbs., practically it requires 142½ lbs. of air to effect the perfect combustion of 1 gallon of oil, or 1,872 6-7 cu. ft. of air at 62° F. at 100° F., 2,.009¼ cu. ft. are required. If compressed air be used as atomizer, only about 1-6 of the air needed for the perfect combustion of the fuel is obtained through the burner, the rest being furnished through an ordinary air nozzle placed immediately under the

General View in Process Building, Showing Exhibits of Robeson Process Co., Detroit Foundry Supply Co., and Canadian Machinery.

burner. This air at 3 or 4 oz. pressure is obtained from a Buffalo or Sturtevant blower.

General View of the Foundry, Showing the Baillot Cupola, in the Background, the Core Oven of the J. D. Smith Foundry Supply Co., and the Melting Furnaces of the Monarch Engineering & Manufacturing Co.

I have often been asked to give an estimate upon the cost of compressing air per cubic foot. Vain, however, have been my attempts to give a definite answer to this question, for there is such a vast difference between theory and practice, and furthermore, the conditions in no two plants are precisely alike. In some works steam driven compressors are used, while in others there are compound compressors. Some employ electrical power to compress the air, while others use gasolene engines. Again, too, if steam driven compressors are considered, the many grades of coal vary as much in calorific value as they do in price.

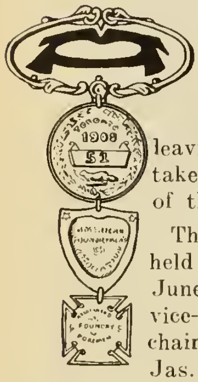
To those who contemplate installing liquid fuel in their plants a few words in regard to the supply tank, etc., may prove of interest. To conform with the requirements of the underwriters as well as the various city ordinances, it is necessary that the fuel supply tank (varying in capacity from one thousand to ten thousand gallons) be placed some distance from the buildings. It should be provided with a vent pipe extending at least two feet higher than the shop building and placed ten feet or more from any chimney or smoke stack. Ten or twelve lbs. pressure is usually maintained on the fuel line and an ordinary steam driven brass lined duplex pump or a belt driven triplex plunger pump may be used to pump the fuel. A pulsometer, with gauge and a pressure valve with an overflow pipe connecting with the storage tank, should always be placed upon the fuel line so that when one or more of the burners are closed off, an even pressure will be maintained upon the fuel supply pipe line to the other burners by the release of excess oil through the pressure valve, the fuel returning to the storage tank through the overflow pipe.

In this article I do not deem it necessary to mention the various types of liquid fuel brass melting furnaces, for doubtless our members are familiar with both the open-fired and crucible furnaces and know of the convenience and various economies effected thereby, such as there being no handling of the fuel, no sifting and disposing of the ashes, the increased output of superior quality and that as the heat may be increased or decreased at will, any alloy may be melted. But whatever the type of furnace, I always recommend that a combustion chamber, built along scientific lines, be used, for it directs the course of the heat in the furnace and provides for the union of the air requisite for perfect combustion with the consuming fuel before they reach the furnace proper. Those who have given the fuel of the twentieth century a most thorough test have proven conclusively that it is the incomparable fuel for all work connected with the brass foundry, core-drying as well as melting, etc., but of course in order to obtain the highest possible efficiency from the fuel, modern equipment must be used in every detail, the fuel must be thoroughly atomized by the hydro-carbon burner, the fuel supply must be constant at all times and the furnaces must be so constructed as to meet every requirement.

General View in Machinery Hall, Showing Exhibits of Arcade Mfg. Co., the Calumet Engineering Co., the French Machine in E. H. Mumford's Exhibit, and the Dust Extractor in W. W. Sly Mfg. Co.'s Exhibit.

Business Meeting of the Associated Foundry Foremen

Important Changes in the Constitution—Election of Officers—Suggestions Regarding a Closer Relationship Between the Several Allied Organizations



ALL the business of the Associated Foundry Foremen was dispensed with before the convention proper opened, leaving the members free to take part in all the features of the convention.

Their business meeting was held on Monday evening, June 8, W. S. McQuillan, vice-president, being in the chair, the president, Mr. Jas. Webb, not being at the convention. About fifty members were present.

The president addressed the meeting, impressing upon those present the fact that the object of their organization was educational; that it was for this purpose that they gathered together once every year. "To find ways and means by which material can be saved and better work produced is the end to which we are anxious to attain. Standing, as the foreman does, between the two elements which constitute the foundry business, the labor and the capital, it is our duty to educate ourselves so well that we shall be able to lead the way in the business." He pointed out the fact that experience in the past years had shown that some changes in the organization were necessary to further promote the interests of the association.

The Secretary's Report.

The report of the secretary-treasurer, Mr. F. C. Everett, showed the association to be in a much better financial condition than in previous years, and that the total membership is now 469, a net gain of 99 members during the past year, a good many of these being Canadians.

Changes in the Constitution.

The most important business transacted at the meeting was the changes in the constitution which were effected. At lat year's meeting a committee had been appointed to take this matter up, and report at this meeting. The report of this committee, after considerable discussion, was adopted as a whole. The changes in the constitution consisted of additions to the by-laws relating to the manner of election of officers, and also that retiring presidents be elected to honorary membership, retaining all the privileges of membership, except that they would not be subject to the payment of dues.

Election of Officers.

The nominating committee, which had been appointed during the early part of the meeting, reported as follows, which report was unanimously adopted :

W. S. McQuillan, President-Elect of Associated Foundry Foremen.

President—W. S. McQuillan, Warren, Pa.

Vice-Presidents—H. J. Holmes, Cincinnati, Ohio, and J. Gaffney, Montreal, Que.

Secretary-Treasurer—C. E. Hoyt, Chicago.

District Vice-Presidents—W. F. Grunau, Erie, Pa.; Henry Biegel, Milwaukee; E. W. Smith, Chicago; D. C. Wilson, New York; W. A. Keeler, Indianapolis; C. A. Olsen, Cleveland; W. A. Perrine, Philadelphia; David Reid, Hamilton; John Logan, Cincinnati; M. J. Walsh, Montreal; J. F. Webb, Davenport, Iowa.

C. E. Hoyt, Newly Elected Secretary of Associated Foundry Foremen in Convention Room.

Suggestions From Chicago.

Mr. E. W. Smith, a member of the local organization in Chicago, outlined the reasons for the success of that organization, pointing out that the sole object of their organization was educational, and that their meetings were thrown open to any foundry foreman, whether a member of their organization or not. He pointed out that the business of their local organization was handled by their executive committee, and they had found that this was a very good plan. Mr. Smith suggested that the same plan be adopted with the Associated Foundry Foremen's organization.

Plans for Coming Year.

Mr. H. M. Lane and Dr. Richard Moldenke told of the movement on foot, which had been suggested and started by L. L. Anthes, vice-president of the American Foundrymen's Association, to bring the four associations, the A.F.A., the American Brass Founders' Association, the Foundry Supply Association, and the Associated Foundry Foremen, into closer relationship, so that no effort be wasted in the advancement of foundry education. For instance, the proceedings and educational papers of all the associations might be published in one volume. The detail executive work of all the associations might be handled by a central executive representative of all four associations.

It was suggested that the proper procedure would be for the executive committees of the different associations to confer together during the coming year. This should not interfere with the individuality of each association, but should result in centralization of effort

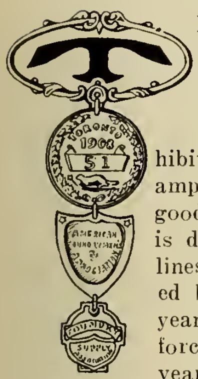
A committee was appointed to confer with the executives of the other associations on this matter. This committee consists of A. W. London, W. A. Perrine, H. J. Holmes, E. W. Smith and F. C. Everett.

The Retiring Secretary.

It was with regret that the meeting accepted the resignation of F. C. Everett as secretary. He has done excellent work during his years of office. Mr. Everett said that it was impossible for him to continue in office because of pressure of his own work. Otherwise, he would not think of giving up the work. Mr. Everett was afterwards made a very handsome presentation by some members of the association.

Foundry Supply Association: Exhibits and Meetings

Officers for Ensuing Year—What was Exhibited—Many New Molding Machines—The Model Foundry with Cupola in Operation.



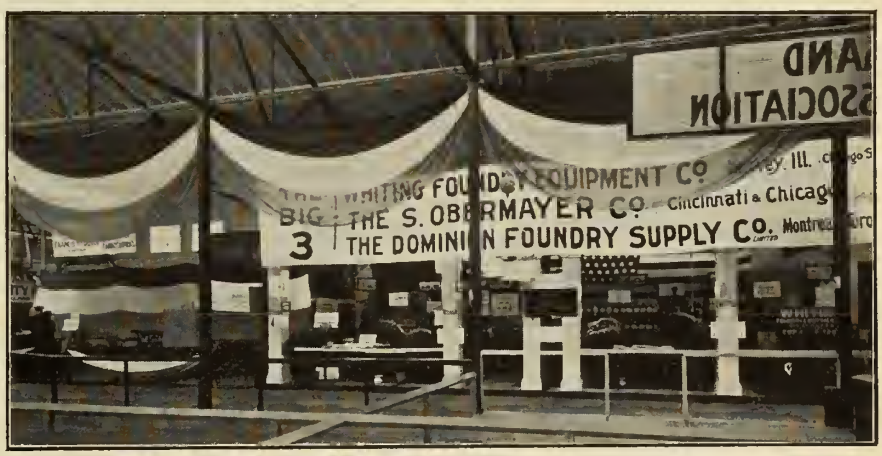
THIS is the third year of the existence of the Foundry Supply Association, and the greatness of the exhibits made this year is ample evidence of the good work this association is doing along educational lines. The work accomplished by the association this year is greater than before. The exhibits this year exceeded those of last year both in tonnage and floor space occupied. Considerable development in foundry machinery and supplies could be noted since last year. In molding machines especially there has been considerable development. Quite a number of new machines have been placed on the market since last year, each with a place of its own, many of them being good additions to molding machine practice. Improvements have been made in other machines which make them more efficient and reliable.

A feature of the exhibits this year was the foundry in operation, equipped with cupola, a molding floor, molding machines, core benches, core oven, melting furnaces, and actual foundry work was carried on continuously, thus showing up to advantage the operation of the cupola, the core oven, the melting furnaces, the sand blast apparatus, etc.

General View in Process Building, Showing the Exhibits of the Hamilton Facing Mills Co., the Detroit Foundry Supply and J. S. McCormick Co.

Officers for Ensuing Year.

At the meeting of the association at the King Edward Hotel on Thursday night, June 11, the following officers were elected :



General View Showing the Booths of the Big 3, Hill & Griffith, and Francis Hyde & Co., Montreal.

President—F. N. Perkins, Arcade Mfg. Co., Freeport, Ill.

Vice-Presidents—John Hill, Hill & Griffith Co., Cincinnati, O.; E. J. Woodison, Detroit Foundry Supply Co.; T. W. Pangborn, Thos. W. Pangborn Co., New York; Geo. H. Wadsworth, Falls Rivet & Machine Co., Cuyahoga Falls.

Secretary—H. M. Lane, Cleveland.

Treasurer—J. S. McCormick, Pittsburgh, Pa.

Trustees—J. S. Rayner, Carborundum Co.; J. S. Smith, J. D. Smith Foundry Supply Association ; A. O. Backert, Cleveland; E. H. Mumford, J. H. Whiting, Whiting Foundry Equipment Co., Harvey Ill.

Important matters were taken up, including the appointment of a committee to draw up a new constitution.

The Exhibitors and the Exhibits.

ARCADE MFG. CO., FREEPORT, ILL., exhibit their new automatic molding machine, illustrated and described in the last issue of Canadian Machinery. They also showed two new rollover machines, which are illustrated and described in another part of the paper. Their new No. 3 "Modern" machine was also shown. All these machines were operated. In attendance were F. N. Perkins and Reeve Burton.

E. KILLINGS MOLDING MACHINE WORKS, DAVENPORT, IOWA, exhibited their new rollover straight drop machine, which is illustrated and described in another part of the paper ; also their new motor-driven universal saw table. Continuous demonstrations with the molding machine were given. In attendance were, E. Killing, M. K. Weigel, P. G. Potter and C. P. Aabye.

BERKSHIRE MFG. CO., CLEVELAND, O., showed in continuous operation their "Berkshire" automatic molding machine, which was subjected to many tests. Six different pattern plates were used on the machine, showing the variety of work done, and the exhibit of castings from molds made on the machine also showed the variety of work done. Their aluminium snap flasks were used on the machine. In attendance were R. H. York, president ; J. N. Battenfield, general manager, and C. F. Battenfield.

HENRY E. PRIDMORE, CHICAGO, had in operation one large rollover molding machine, one stove plate machine, two stripping plate machines and one small rollover machine.

TABOR MFG. CO., PHILADELPHIA, PA., operated five molding machines : their new 30x8 inch rollover machine shown first at the exhibit

of Chicago Foundry Foremen, and described in a recent issue of this paper; power rammer, 10x32-in. machine for bench work; their 14x16-in. split pattern machine, and their 18x5-in. roll-over or hinged machine. In attendance were Winfred Lewis, president; C. W. Coleman, J. H. Coleman and W. E. Galleger.

J. W. PAXSON CO., PHILADELPHIA, Pa., exhibited quite a complete line of foundry supplies, including a cabinet of brushes, shovels, torches, etc. The "Glenwood" rockover molding machine was shown in operation. Other exhibits included the Paxson-Sawyer magnetic separator and the plunger type core machine for round, eleptical or square cores, operated by steam or compressed air. Paxson ladel lining or cupola dobbing was also a feature of the exhibit.

A. BUCH'S SONS CO., THE MITCHEL-PARKS MFG. CO., AND THE ONTARIO WIND ENGINE AND PUMP CO., TORONTO, occupied joint space, and exhibited the gravity molding machine, which machine is illustrated and described in another part of the paper. This machine is now made in Canada by the Ontario Wind Engine & Pump Co. Some examples of work done on this machine are an ⅛-in. plate, 25x38 inches of uniform thickness, and a casting with deep draw and pockets 12 inches deep. Another machine on exhibit was the Parks portable jarring molding machine, just placed on the market, and which is illustrated in another section of the paper. Representing A. Buch's Sons Co. were R. S. Buch, president; C. A. West and J. N. Courtney. Representing Mitchel-Parks Mfg. Co. were Dennis Parks and J. N. Bonnar.

HAMILTON FACING MILLS BOOTH. In this booth were included the exhibits of the Hamilton Facing Mills Co., Hamilton; the Reid Foundry and Machine Co., Ingersoll, and the Falls Rivet and Machine Co., besides which Sheldons Ltd., Galt, showed several blowers. This booth contained a handsomely fitted up reception room, where many a visitor was rested and refreshed. The "Made in Canada" sign was conspicuous. The Hamilton Facing Mills Co. exhibited a line of foundry supplies, including sands, facings, core compounds, Smooth-On, brushes, etc. The Reid molding machine was demonstrated to good effect. The plate on the machine attracted considerable attention. An article on this machine appeared in the last issue of Canadian Machinery. The Falls Rivet & Machine Co. exhibited the Wadsworth improved core oven, the Wadsworth core cutting off and coning machine, capacity ½ to 7 ins., a number of Wadsworth core machines, including the multiple spindle machine. What these core machines can do was shown by an exhibit of cores of different shapes and sizes. A line of coal and coke barrows and hand and power shakers was shown by the Hamilton Facing Mills Co. This booth was very handsomely decorated with bunting, and everything combined to make it a lasting credit to these firms. Representing the Hamilton Facing Mills Co. were Wm. J. Thompson and E. B. Fleury. R. H. Wadsworth represented the Falls Rivet & Machine Co., and David Reid, the Reid Foundry & Machine Co.

THE BIG THREE BOOTH. The Dominion Foundry Supply Co., the S. Obermayer Co., and the Whiting Foundry Equipment Co. combined their exhibits into one, the "Big Three" exhibit. Their booth was large and handsomely fitted-up. The large booth, the large sign and the attractive decorations all contributed to make the booth one which could not be missed. Representing the Dominion Fdy. Sup. Co. were Geo. H. Weaver and F. J. Ross; Whiting Foundry Equipment Co., A. W. Moyer and H. L. Mills; S. Obermayer Co., Samuel Johnston and H. F. Frohman. Among the exhibits were the Moyer tramrail system, Whiting geared ladles, molding sands, core sands, parting compounds, core compounds, etc., Dominion Fdy. Supply core oven, electric hoist and solenoid brake for Whiting crane, a complete line of foundry supplies, etc. Of great interest was the photo rack and blue-prints of the Whiting cupola.

General View in Machinery Hall, Showing Exhibits of Henry E. Pridmore, E. Killing's Molding Machine Works, and the Standard Sand & Machine Co., Whose Sign is Hidden.

THE DETROIT FOUNDRY SUPPLY CO., had a complete exhibit of foundry supplies. Their booth was a large and attractive one, their souvenir and E. J. Woodeson's smile being great drawing cards. They made a special exhibit of Eureka blacking, demonstrating its qualities as a core wash. Other features of their exhibit were the Woodison oil furnace, illustrated in a recent issue of Canadian Machinery, iron snap flasks, sprue cutter, tilting tumbling barrel, the 20th Century portable pneumatic molding machine. The Crandall cupola would have been on exhibit had not they been notified that they could not show it in their exhibit space because of wires. In attendance were E. J. Woodison, L. A. Crandall and W. R. Beers.

FRANCIS HYDE AND HILL & GRIFFIN. Combined in one space were the exhibits of Hill & Griffin and their Canadian agents, Francis Hyde, Montreal. Some features of the exhibit were Blodgett's core oven and the King's molding machine, both made in Canada by Francis Hyde. There was also shown snap flasks, a line of foundry supplies, some Harbison-Walker fire bricks, and a number of the Bridgeport Crucible Co.'s crucibles. At this convention Francis Hyde secured the Canadian agency for the Robeson Process Co. for "Glutrin," and also Canadian agency for the Western Foundry Supply Co. A. N. Cote was in charge.

THE ROBESON PROCESS CO., AU SABLE FORKS, N.Y. This was a most attractive booth, handsomely decorated with bunting and fir trees. "Glutrin" is made from the fir tree, and some of the steps in its production were shown in the booth. In this booth in a nice easy chair, visitors heard all about "Glutrin" core binder from the gentlemen in attendance, J. S. Robeson, D. S. Robeson, Geo. N. Moore and Henry R. Donald.

THE AUTO SAND MIXER CO., BRANTFORD AND PEQUA, O., showed their sand mixer, which is operated by gasoline engine. A photo of this machine appears in another part of this issue. In attendance were N. D. Mills, Brantford, and Chas. Gillespie.

E. H. MUMFORD, PHILADELPHIA, exhibited one of his French universal molding machines, concerning which so much has been written lately, a pneumatic power squeezer for use with match plates and gates, a split pattern vibrator machine and a sand-mixing machine. Something which attracted considerable attention was the demonstration of how pattern plates are made under the universal system. In attendance were E. H. Mumford and C. S. Lovell.

KROESCHELL BROS. CO., CHICAGO, demonstrated the Kroeschell-Schwartz gyrating flame crucible furnace, which attracted very considerable attention. In attendance were E. H. Schwartz and Wm. Kroeschell.

THE W. W. SLY MFG. CO., CLEVELAND. One of the largest exhibits was that made by this firm. One of the most interesting features of the exhibit was their combination lathe and pattern gear-cutting machine, which has just been brought out within the last few months. Their exhaust steel tumbling mills, cinder mills, resin mills and dust arrester made up the rest of the exhibit. Their souvenir, the spectacles, made quite a hit. In attendance were W. W. Sly, W. C. Sly, H. R. Morse and D. A. Livensparger.

STANDARD SAND & MACHINE CO., CLEVELAND, showed their sand-mixing machinery, sand-conveying machinery and sand pulverizing machinery. They were represented by H. G. Broughton, president and general manager.

General View of North End of the Process Building, Showing Exhibits of the Goldschmidt Thermit Co., Frederick B. Stevens, Western Foundry Supply Co., and Stanley Doggett.

THE HERMAN PNEUMATIC MACHINE CO., ZELIENOPLE, Pa., had an operating exhibit of their large pneumatic jarring machines, such as was shown at Philadelphia last year. They also had a small model of their jarring machine, showing operation of the machine.

THE HAWLEY DOWN DRAFT FURNACE CO., CHICAGO, had an excellent exhibit of the Schwartz melting and refining furnaces of different sizes and styles, the large furnace being a feature of the exhibit buildings, as far as size was concerned. In attendance were Mulford D. Farrand, G. F. Coleman and Col. C. E. Bleyer, president.

View of the Exhibits of the Hamilton Facing Mills Co., the Falls Rivet and Machine Co., the Reid Foundry and Machine Co., Sheldon's, Ltd., and Smooth-On Mfg. Co.

MONARCH ENGINEERING CO., BALTIMORE, exhibited in operation a number of the Steele-Harvey crucible melting furnaces, including their special lifting-out crucible furnace with tangent or direct flame action. The rivet-heating furnace was a feature of the exhibit, as was also the ladel heater. In attendance were David R. Steele, Harry D. Harvey, James H. Fowler, John Carter and Jas. V. Martin.

J. D. SMITH FOUNDRY SUPPLY CO., CLEVELAND, supplied the core oven used in the foundry to bake the cores. This oven came in for a good deal of investigation, because of the many good features. They also showed the Druckleib sand blast in operation, and pneumatic riddling machines. In attendance were F. A. Coleman, J. S. Smith and M. S. Finley.

J. DE CLERCY, MONTREAL. The feature of the whole convention was the foundry in operation, the cupola for which was installed by J. de Clercy, Montreal. This is a French cupola, the Baillot. This cupola came in for a good deal of favorable comment, because of its advantageous features.

FOX MACHINE CO., GRAND RAPIDS, MICH., exhibited a line of machinery for the pattern shop, including the Fox universal trimmers and core box machine. In attendance were G. K. McMullen and G. B. Jenkinson, representing A. R. Williams Machinery Co.

NORCROSS MOLDING MACHINE CO., TERREHAUTE, IND., had a small booth from which literature descriptive of their molding machines was distributed.

J. S. McCORMICK CO., PITTSBURG, had a large and miscellaneous exhibit. A millet core oven manufactured by the Millet Core Oven Co., Brightwood, Mass., was on exhibition, as well as a sand blast made by the Farnham Sand Blast Co., New York. A panel of molders' tools and a bicycle made of foundry tools were shown. Two McCormick tumbling barrels were in operation. In attendance were J. S. McCormick, T. E. Malone and S. R. Castley for the McCormick Co., and W. W. Farnham, of the Farnham Sand Blast Co.

THE GOLDSCHMIDT THERMIT CO, NEW YORK AND TORONTO, had an interesting and instructive exhibit. Molds and crucibles for work of all sizes were shown as well as various samples of iron free from carbon used in the process. Numerous samples of work were also on exhibition. The most interesting feature was a demonstration of the process. It was shown how hubs may be welded on, plates and holes burnt in ¾-in. plates in a few seconds. A. M. Guenther, traveling engineer, and N. Olds, Toronto, agent for Canada, were present.

ARTHUR KOPPEL CO., NEW YORK, were exhibiting a model of their industrial railway cars and equipment for use in foundries. H. C. Kraft was representing the company.

JONATHAN BARTLEY CRUCIBLE CO., represented by Jonathan Bartley and A. M. Maddock, Jr., were showing photographs of their extensive plant, which is in course of construction in Trenton, N.J.

THE WESTERN FOUNDRY SUPPLY CO., NEW YORK, were showing samples of their ground ferro-alloys for castings. Francis Hyde, & Co., Montreal, are the Canadian agents. J. A. Rogers, of New York, and W. G. Nixon were in attendance.

General View From West End of Machinery Hall, Showing the Exhibits of the Berkshire Mfg. Co., the Tabor Mfg. Co., the Hawley Down Draft Furnace Co., the Canadian Pneumatic Tool Co., and the Herman Pneumatic Machine Co.

THE CANADIAN PNEUMATIC TOOL CO., MONTREAL, had an extensive exhibit of pneumatic tools. A Franklin air compressor was also in operation, supplying air to molding machines. N. J. Holden Co., Ltd., Montreal, are the Canadian sales agents. J. B. Wilson, Toronto, was in charge.

TORONTO TESTING LABORATORIES LTD., had a booth. They ran tests on the materials used in Machinery Hall in their city laboratory. J. D. Stoddard and H. Lemont were in attendance.

BAIRD & WEST, DETROIT, had samples of by-product coke manufactured by the Solvay Process Co., Syracuse, N.Y. The Standard Fuel Co., Toronto, are sole Canadian agents. Those present at the convention were, A. T. Long, Chicago ; H. Drysdail, Detroit ; G. Nash, Toronto.

THE CARBORUNDUM CO., NIAGARA, N.Y., had a tastefully-arranged booth. Samples of every type of stone manufactured by them were displayed to good advantage. In the centre of the booth a pyramid of crude carborundum attracted considerable attention. The stones of all grades, as well as the cloth and paper, are made by the vitrified process. Rice Lewis & Sons, Toronto, are the Ontario agents. W. C. Rankine, traveling Canadian representative ; G. R. Rayner, secretary of the company, and R. B. Fuller, Niagara Falls, N.Y., were in attendance.

THE HAUCK MANUFACTURING CO., OF BROOKLYN, represented by A. Link and A. E. Hauck, were demonstrating the Hauck burner for skin-drying molds, heating ladles, brazing etc. These burners may be used with crude oil or kerosene, and are suited for power or hand compressors. The Merrick Foundry Supply Co., Toronto, are the Canadian agents.

THE HOLLAND LINSEED OIL CO., CHICAGO, demonstrated the use of their linseed oil core mixture by making souvenir match holders from native and Ballous white sand. A. H. Barer, Chicago was in charge.

THE BUFFALO FORGE CO., BUFFALO, supplied a blower to exhaust from the cleaning brush of the Osborn Mfg. Co. The Canadian Buffalo Forge Co., Montreal, are the Canadian agents.

THE GENERAL ELECTRIC CO.,SCHENECTADY, N.Y., were operating a 50 h.p. Curtis steam turbine direct connected to a 7,000 cu. ft. centrifugal air compressor. J. G. Callen and D. Clark were in charge.

THE OSBORN MANUFACTURING CO., OF CLEVELAND, had a large assortment of foundry supplies, including their "Economy" wire wheel brushes and compressed lumen polishing wheels. H. R. Atwater, F. D. Jacobs, C. V. Jacobs, and C. D. Eadie were in attendance.

THE GREGG MANUFACTURING CO., OF CLEVELAND, was showing an automatic core wire cutter. This cutter takes the wire from the reel, straightens it and cuts it into any length from ½-in. to 12 inches, automatically. It does away entirely with hand cutting and cuts at the rate of 100 per minute. M. Gregg, N. W. Lewis and J. H. Webster were in attendance.

FREDRIC B. STEVENS, DETROIT, were showing foundry supplies and polishing materials and foundry facing plumbago. A. T. Wagner and W. M. Wilson were in attendance. The company have a warehouse in Windsor,

Ont. A. T. Wagner is the Canadian representative.

R. B. SEIDEL, INC., PHILADELPHIA, had on exhibition samples of their crucibles, stoppers and nozzles. W. E. Neville was in charge.

THE JOSEPH DIXON CRUCIBLE CO., JERSEY CITY, had a well-arranged exhibit of crucibles. A feature of their exhibit was a number of crucibles which had been in use and still looked good for more. Samples of plumbago foundry facings were shown. Those present were A. L. Haasis, eastern representative, and W. Coane and J. Condit.

The Auto-Sand Mixer, Made in Brantford by the Auto-Sand Mixer Co.

THE CANADIAN LABORATORIES, LTD., TORONTO, showed results of physical tests of iron and steel, and results of tests on ores and supplies. S. B. Chadsey and W. K. McNeil were in attendance.

STANLEY, DOGGETT & CO., NEW YORK, showed samples of their facings and parting and Fillet iron cement. M. Doggett and A. J. Johnson were in attendance. Their very handsome souvenir in the shape of a watch-fob was much sought after.

W. W. LINDSAY, PHILADELPHIA, represented by J. J. Hasy, had an assortment of their foundry chaplets and anchors on exhibit.

THE CLEVELAND WIRE SPRING Co., CLEVELAND, had an exhibit of steel barrels and boxes for foundry and general manufacturing plant use. J. W. Campbell was in attendance. The souvenir of this company was something worth getting after, being a nickel-plated spring in form of paper weight.

P. H. & F. M. ROOTS CO., NEW YORK., exhibited their rotary blower. H. M. Hapworth was in attendance.

Hall Engineering New Works.

The Hall Engineering Works have moved into their large new shops, 14 to 16 Jurors Street, Montreal. The works are large and airy, giving room for the handling of large and heavy work. The machine shop is specially adapted for heavy work and at the present time a job of over three tons' weight is being erected. A traveling crane is under construction and will run the whole length of the shops.

In the rear is the blacksmith shop and here is a steam boiler for testing all machinery, pumps, etc., before they leave the works. Several new machines are being added to the equipment and all are set on a solid concrete foundation.

A tool room has been erected and also spacious offices. Above these are the pattern shelves and stock supplies. The new factory is well fitted for the work they carry on, and at the present time they are very busy. In addition to carrying on a general business as engineers, boilermakers, brass and iron founders, ship repairs, etc., they are agents for Hall's refrigerating machinery, W. H. Allen's electrical machinery, pumps and fans, all kinds of asbestos goods and boiler preservatives.

Tariff Department for C.M.A.

For the assistance of the members the Canadian Manufacturers' Association has organized a tariff department. Every manufacturer has his own tariff problems. In most cases it is impossible for the individual to have these satisfactorily settled. It will be the work of the new department to go into these questions thoroughly and seek a remedy only when the justice of the request is clearly shown.

The association is fortunate in having secured the services of R. W. Breadner as manager of the new department. Mr. Breadner has a thorough knowledge of the tariff and the way it is administered. At the present time he is a member of the Board of Customs and holds the offices of Dominion Appraiser and Inspector of Customs. He is consequently closely in touch with actual conditions under which the tariff is operating. His intimate acquaintance with the situation will enable him to adjust difficulties with the utmost despatch.

General View in Machinery Hall, Showing Exhibits of E. H. Mumford Co., W. W. Sly Mfg. Co., Rear View of the Crucible Furnace of Kroeschell Bros., and in the Background the Exhibit of the Osborne Mfg. Co.

G.T.R. Apprenticeship Examinations.

The annual competitive examination of apprentices on the Grand Trunk Railway System has just been completed, subjects being mechanical drawing and practical mechanics. The number of apprentices competing was 283, with the following standing as regards stations:—1st, Montreal; 2nd, Stratford; 3rd, Fort Gratiot, 4th, Toronto, and 5th, Portland, and very marked progress has been shown and very creditable work done by the apprentices during the winter. The railway company, as well as the boys, feel the benefit of this. A large exhibit has been forwarded to the Master Mechanics' Convention at Atlantic City, which takes place June 17th until June 24th.

The following apprentices obtained prizes in mechanical drawing:—

Montreal—1st year, G. Inns; 2nd year, P. Drummond; 3rd year, W. Thorpe; 4th year, H. Thomas; 5th year, A. Hunter.

Stratford—1st year, J. F. Tonge; 2nd year, A. P. Stone; 3rd year, L. M. Lunsky; 4th year, R. R. Lundy; 5th year, W. Sealy.

Fort Gratiot—1st year, J. M. Vicary; 2nd year, John Beach; 3rd year, T. E. Rice; 4th year, F. G. Abey; 5th year, J. L. Forster.

Toronto—1st year, A. Jacques; 2nd year, W. Campbellton; 3rd year, A. Wiles; 4th year, W. Large.

Deering—2nd year, G. A. C. Renell; 4th year, C. E. Harris.

The following apprentices obtained prices in practical mechanics:—

Montreal—1st year, F. Allen; 2nd year, P. Drummond; 3rd year, W. Thorpe; 4th year, W. Twigg; 5th year, A. Hunter.

Stratford—1st year, E. Porter; 2nd year, N. Durst; 3rd year, O. Cooke; 4th year, A. Chenoweth; 5th year, W. Sealy.

Fort Gratiot—1st year, R. J. Kerwin; 2nd year, J. Beach; 3rd year, M. E. Burkholder; 4th year, F. G. Abey; 5th year, F. W. Hornsby.

Toronto—1st year, A. Jacques; 2nd year, W. Campbellton; 3rd year, A. Wiles; 4th year, W. Large.

Deering—1st year, W. E. Courtland; 2nd year, G. A. C. Renell; 3rd year, C. G. Harris.

Personal Mention.

Mr. Ernest A. Wilkinson will represent the Lunkenheimer Co., Cincinnati, O., in Canada, in conjunction with Mr. John Carlind.

Some New Molding Machines at the Toronto Convention

Many Developments During the Past Year—New Rollover Straight Drop Machines — New Portable Machine — Gravity Machine — New Rockover Machine

In molding machine practice great strides have been made during the last few years, and the exhibit of machines at Philadelphia was a revelation to many a foundryman; and even during the past year many improvements have been made and new machines placed on the market. The new automatic machine of the Arcade Mfg. Co., which was illustrated and described in the last issue of Canadian Machinery, was shown at Toronto for the first time. This firm also showed two new rockover machines which will be illustrated here. The gravity molding machine, which is now being made in Canada by the Ontario Wind Engine & Pump Co., attracted considerable attention. The new rollover machine of the Tabor Mfg. Co. was shown at Toronto. This machine was fully described in the April issue of Canadian Machinery. One of the French machines, which attracted so much attention last year, was shown at Toronto by the E. H. Mumford Co. Another machine, which attracted considerable attention, was the Reid molding machine, now being made in Canada by the Reid Foundry & Machine Co., Ingersoll. An article on this machine appeared in the last issue of this paper.

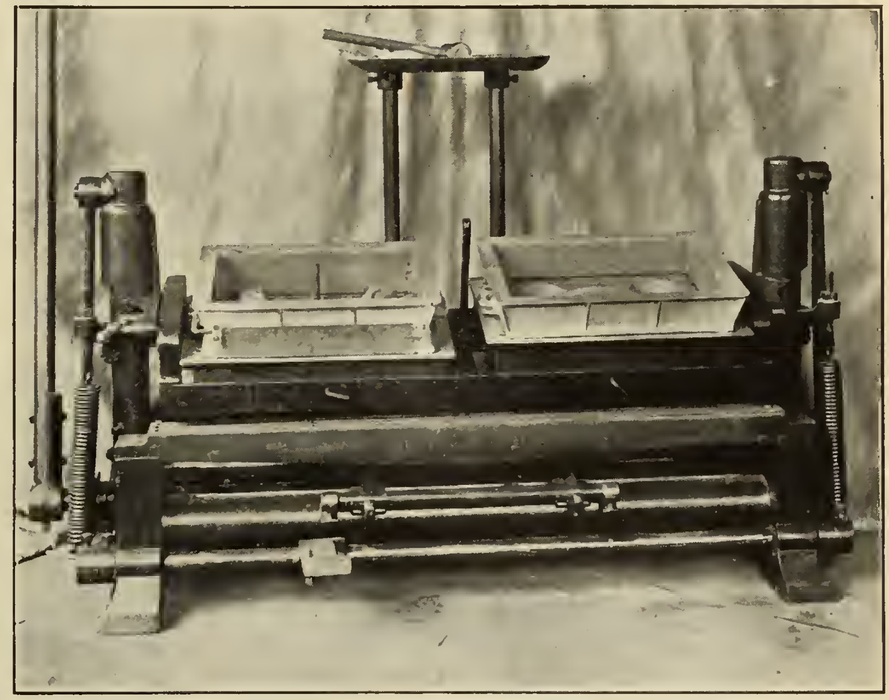


Fig. 2—The Parks Automatic Portable Molding Machine.

New Rollover Straight Drop Machine.

E. Killing, Molding Machine Works, Davenport, Iowa, showed at Toronto their new rollover straight drop machine, which was first shown at Chicago in March.

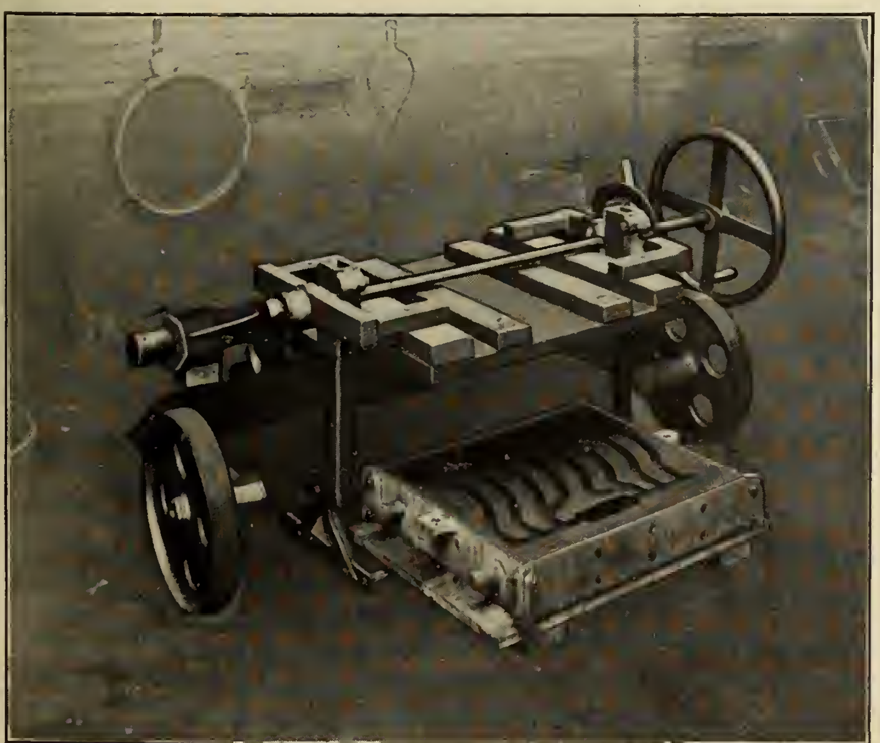


Fig. 1—New Rollover Straight Drop Machine.

This machine, shown in Fig. 1, is adapted for most any class of work and cope as well as drag can be molded on it. The pattern plate revolves around it's own centre, which saves time and hard work, because the weight of the flask will do the rolling over itself.

The operation is as follows: The flask is set on the plate and rammed up, the bottom board is put in place and clamps down with automatic adjustable clamps, which will take care of any crooked bottom board, and as the clamps are attached right to the machine, all the time, which is generally wasted in hunting up the clamps, is saved with this machine.

The next operation, is to release a pattern plate by means of a lever, turn the mold over and by turning a hand wheel the mold is set on the floor without extra help. The machine, which is mounted on three large wheels, is then pushed ahead and is ready for making the next mold.

Another good feature of the machine is that it can be swung in any position required. For instance, the operator can make the mold on one end of the machine and deliver the mold on the other side, so that a floor can be built

up without danger of spoiling the previous-made molds.

The machine is very simple in construction. The machine is now built in three sizes: for flasks, 36x24-in., 48x30-in., 60x36-in. but it can be built for any larger size flask which may come up.

The Parks Portable Molding Machine.

The Mitchel-Parks Mfg. Co., St. Louis, exhibited a new portable machine, which is claimed to be the only automatic, portable machine on the market. In this machine all weight is counter-balanced, except the sand itself, and the force of gravity is utilized for ramming the molds by jarring the flasks. This machine is shown in Fig. 2.

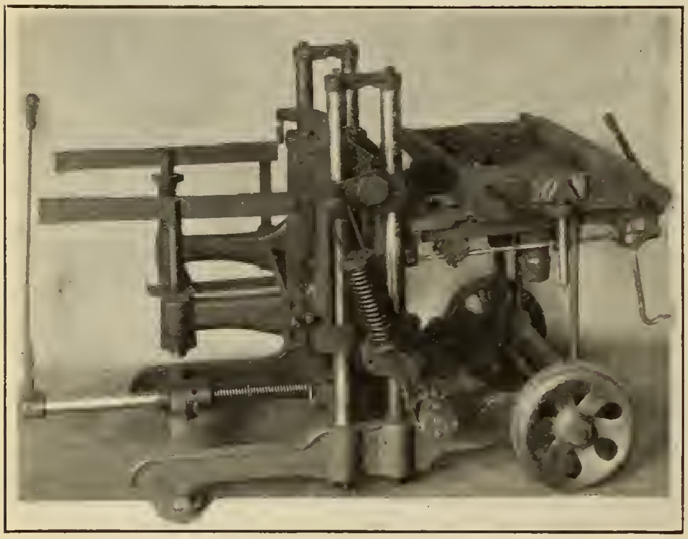


Fig. 3—New Arcade Rockover Machine.

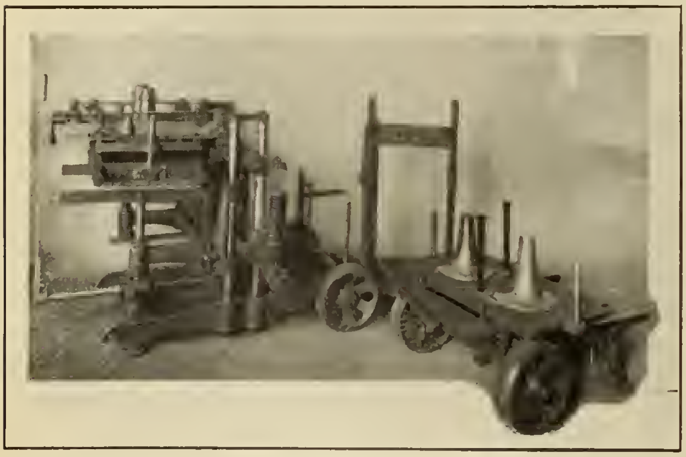


Fig. 4—New Arcade Rockover Machine.

Fig. 5—The Gravity Molding Machine.

The rock-over table or match-plate supports are supported at each end in bearings on piston heads. These heads are secured to the upper end of piston rods; the latter being adapted to move up and down in adjustable brass boxes inside of tubing; the bearings being protected entirely from sand and grit. The rocker-arms at the bottom of the frame work are connected on each side of the machine through the pitmans to the piston heads, and by means of the foot-lever, attached to the rocker-arms, the operator causes the pistons with the rock-over table and flasks to move up and down for the purpose of jarring the sand in the flask; the weight of the flask itself, and all the moving parts, except that of the sand, being counter-balanced or suspended by the adjustable springs.

It will be apparent that each downward stroke will cause the angle irons supporting the match-plate and flask to strike around the patterns, only a few blows being required to attain the degree of firmness desired. Back-boards are clamped on top of the molds, and the latter rolled over and lowered until these back-boards rest upon the bumpers. The operator then pulls down on the hand-lever, which squeezes the backs of the molds and automatically releases the clamp holding the back-boards, and which operation at the same time levels the molds, or brings the patterns into perfect tram with the back-boards, after which the operator, by raising the hand-lever back to its normal position, and at the same time pushing down on the foot-lever, draws the patterns perfectly straight from the mold.

In making snap molds, the cope and drag are rammed up at the same time, while with ordinary flasks the required number of drags from each pattern are first made, after which the copes for same are rammed up.

The Arcade Rockover Machine.

Figs. 3 and 4 show one of the new rock-over machines exhibited by the Arcade Mfg. Co. in Toronto for the first time.

For several years they have been experimenting in their own foundry to produce a machine that will handle a wide range of work with speed and accuracy and be simple enough to be easily mastered by the average laborer.

Fig. 3 shows the Arcade rock-over No. 2 with the drag half of a pattern plate mounted on the table. The flask is in position to receive the sand. At the left of this illustration two parallel bars will be noticed. These are the rests for the mold when it is rolled over as in Fig. 4 and are a part of the adjustable levelling device which takes up any unevenness in the bottom board

and makes the mold accurate at every point.

These illustrations show a machine built for a job requiring a 12-in. lift, but special machines of this design may be made to handle much deeper patterns.

One exclusive feature of the Arcade machines is the method of drawing the patterns. During this operation the table holding the pattern plate is moved upward and the rest holding the mold is lowered at the same time. This plan of separating the mold from the pattern is a great feature of the machine.

The patterns may be vibrated by compressed air or by hand. As will be seen, the table is counter-balanced by heavy springs and a very large mold may be handled with ease and rapidity. In Fig. 4 the machine for making the cope part of the mold is shown. The lever operates the pins which press against the ears on the flask to assist in starting the mold.

There was also shown a smaller machine of much the same type, as well as their new No. 3 "Modern" machine.

The Gravity Molder.

Fig. 5 shows the gravity molding machine as exhibited by A. Buch's Sons Co., which is made in Canada by the Ontario Wind Engine & Pump Co. This machine is automatic.

It automatically riddles the sand, compresses it into properly shaped bodies to any degree of firmness desired.

The flasks are automatically filled with a series of compressed unitary bodies of sand.

The same operation, which automatically fills the flask simultaneously rams up the mold uniformly throughout, regardless of the depth of the flask or the size and shape of the patterns.

It strikes off the surplus sand from the top of the filled flask.

The matchboard with pattern is automatically rapped with pneumatic vibrator while pattern is being drawn.

It automatically draws the pattern perfectly straight from the mold without the aid of stripping plates and without breaking down the sand on the most intricate or difficult work.

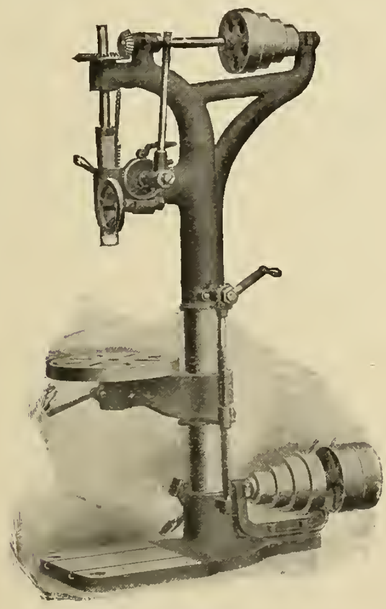
While it is being elevated each bucketful of sand is engaged by a compressor which automatically packs the sand in the buckets to any degree of firmness required.

In making a mold the operator simply clamps a matchboard with the lower half of the pattern in position on the cradle. A flask is then placed in position on the matchboard, and when the machine is started by means of a lever, the swing carrying the flask is swung back and forth until the flask is filled and rammed up. The machine is then stopped by the same lever and the strike-off swings into position and, while the cradle is still swinging, strikes off the surplus sand from the top of the flask from where it falls back into the hopper below, the strike-off then swings back out of the way. The flask is then quickly clamped to the cradle, by means of a special clamp, turned over, and automatically lowered to the supporting bars underneath; the clamp is then released, and, by means of a brake lever, the operator causes the cradle carrying the matchboard to rise or ascend back to its normal position, drawing the pattern perfectly straight from the mold. This mold or drag is then carried away by one of the jib cranes, or other suitable means, and placed on the floor while at the same time an empty flask is being placed on the cradle, and the operation repeated as before; the entire operation for completing the mold requiring but a few moments' time.

NEW UPRIGHT DRILL.

The Canadian Fairbanks Co., Ltd., have brought out a new 20 in. plain wheel and lever feed upright drill, an illustration of which is shown.

Among the characteristic features are the following: Combined lever and wheel feed, each independent of the other when in use; feed mechanism very strong and adapted for heavy or light drilling; cone pulleys provide four speeds; the spindle is counterbalanced, and has quick return; provision is made for taking up lost motion; the table has vertical adjustment on the columns by means of a screw and can be swung to one side, allowing the use of base plate when necessary; a clamp table is provided, insuring quick action; the drive is controlled by a foot lever giving the operator the free use of his hands.



New Upright Drill.

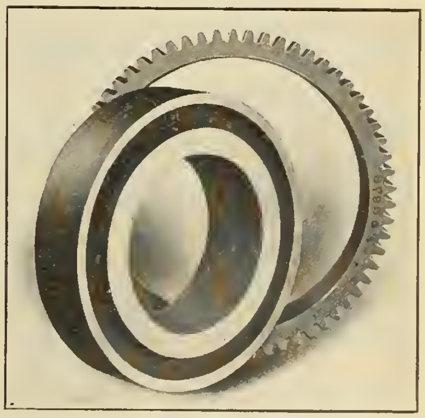
The dimensions of this drill are as follows: Feed of spindle, 8 in.; spindle to base, 42 in.; diameter of table, 16 in.; diameter of spindle in bearing 1 5-16 in.; diameter of column, $5\frac{1}{4}$ in.; driving pulleys, $9\frac{1}{4}$ in. x $2\frac{3}{4}$ in.; speed, 300 revolutions per minute; weight, 600 lbs.; floor space, 18 in. x 46 in.; hole in spindle is Morse taper No. 3.

A NEW REMOVABLE ROLLED RIM GEAR.

The illustration shows a new gear for high speed and heavy haulage trolley service now being placed upon the market by the R. D. Nuttall Company. In conformity with the well established principle of this company, the gear, known as the Nuttall Removable Rolled Rim, was first put to severe tests in actual service. In all of these tests the performance proved exceptionally satisfactory.

The rim is made of a special grade of rolled steel of high tensile strength, and is shrunk on a cast steel centre. Thus the two members become practically a single piece. When worn, however, the rim can be easily removed and replaced at nominal cost, so as to make a practically new gear.

The rim can be attached to any style of centre or spider. It is not limited to trolley service, but can be applied to any service where the diameter does not exceed ten feet.



New Removable Rolled Rim Gear.

W. C. Chambers, general foreman Wabash Railway, at St. Thomas, Ont., has been promoted to the Master Mechanic Company's shops at Stanbury, Missouri. G. C. Robertson, general foreman Fort Wayne shops, succeeds him.

J. J. Fletcher superintendent of the boiler department of the Canada Foundry Company, Toronto, has severed his connection with that concern.

CANADIAN MACHINERY
and Manufacturing News

A monthly newspaper devoted to machinery and manufacturing interests mechanical and electrical trades, the foundry, technical progress, construction and improvement, and to all users of power developed from steam, gas, electricity, compressed air and water in Canada.

The MacLean Publishing Co., Limited

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G. C. KEITH, B.Sc., Montreal - Associate Editor

OFFICES:

CANADA
Montreal - 232 McGill Street, Phone Main 1255
Toronto - 10 Front Street East, Phone Main 2701
Winnipeg, 511 Union Bank Building, Phone 3726, F. R. Munro
British Columbia - Vancouver, R. Bruce Bennett, 1737 Haro St.

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Cable Address:
Macpubco, Toronto. Atabek, London, Eng.

SUBSCRIPTION RATE.

Canada, United States, $1.00, Great Britain, Australia and other colonies 4s. 6d., per year; other countries, $1.50. Advertising rates on request.

Subscribers who are not receiving their paper regularly will confer a favor on us by letting us know. We should be notified at once of any change in address, giving both old and new.

Vol. IV. JULY, 1908 No. 7.

BE CAREFUL OF FAKE PROPOSITIONS.

This is the time of the year when many annual publications are being gotten out nominally in the interests of transportation companies and other big concerns. They are usually called an "Official Guide" and claim to be issued under the authority of the president or general manager. The canvassers approach firms who supply or want to supply these corporations with products of one kind or another, and they hint that it is very much in the interests of the firm that they should advertise in this Guide, otherwise, they hint it may affect their business with the corporation.

A couple of years ago, a letter was carried by one of these canvassers alleged to be signed by President Hays, of the Grand Trunk Railway, which was proved to be a forgery. There is another official guide now being prepared in the interests of one of the big railways and claimed to be issued under the authority of the head of the road. A letter has been received from him which states distinctly that his corporation has nothing whatever to do with the publication. The book is issued entirely as a private enterprise, and the giving or withholding of an advertisement will neither help nor hurt any one who has business to transact with the corporation.

When business men are approached by canvassers from publications of this sort, which they believe to be a fake, and most of them are, they should positively refuse to place any business and should write at once to the head of the corporation and get his assurance that the statements made by the canvassers are correct. Certain big firms have been doing this, and in few, if any, cases have they found the statements verified.

GOOD COST SYSTEM ESSENTIAL.

For a manufacturer there is only one thing worse than having no cost or manufacturing system; that is, having a poor one. If he has none he knows that he knows not; but if he has an inefficient one he thinks that he knows but knows not. In conversation with a large stove manufacturer a short time ago he told of an experience of his wherein as a result of his piece and premium system not being closely watched, he had paid over $10,000 more than any other stove firm for the same amount of work in one year. This was only discovered after the firm found they were losing money, and a complete audit of the business had been made.

To properly regulate the price to be paid in straight piece work or a piece and premium system required both detail, experience and competent judgment as well as a good system; but this is only an additional reason that very close attention should be given to the working out of a good system.

It is remarkable the number of manufacturers who do not realize the necessity of keeping track of costs. Their business cannot but be conducted in a haphazard way. It will be noticed that the business firms who make the greatest success are those which are eternally getting after costs and cutting off wasted expenses. That does not mean cutting down expenses where expenses are warranted, but cutting off the thousand and one things which are continually creeping into a business which are waste expenses and which run up the cost of production.

THE BUSINESS OUTLOOK.

The cynic described the barometer as an ingenious instruments which tells us the kind of weather we are having. The Dominion Iron & Steel Co. and other business corporations are not weather barometers, but undoubtedly they are industrial barometers indicating that prosperity is returning with all its force. The Sydney, C.B., plant of the Dominion Iron & Steel Co. is running twenty-four-hour shifts with every available skilled laborer in harness and the output for 1908 is expected to be double that for any previous year. Rails are being manufactured for the C.P.R., C.N.R. and National Transcontinental. The industries at the Soo are now waking into activity. Building permits in Vancouver, B.C., show an advance of 75 per cent. during the past five months. The crop reports from all over the country tell of the good outlook for a great harvest this autumn. The first freight train over the new C.P.R. Sudbury line consisted of two moguls, forty-three cars and two cabooses, with $100,000 worth of Massey-Harris products for the Canadian West. These point towards a bumper crop and prosperity.

Municipalities have been plunging into improvements

and now that it is easier to sell their bonds they will not be justified in repeating their outlay.

When the earnings of the C.P.R. and G.T.R. dropped, immediately the principals weeded out all unnecessary expense, shops were put on short time with reduced staffs and the situation was met in the best possible way. Now that the outlook is bright these companies are arranging for a renewal of activities. The growth of trade in all lines will now be a marked feature, and towards November the barometer will be rising rapidly again. What we must guard against is allowing it to reach fever heat. We are at a point now where we can make a good start on a sure foundation. A cut has been made in the price of steel and the Canadian railroads are carefully considering the question of taking advantage of the drop in the price in the United States. This, with the assurance of a good crop, will start the construction departments at full blast.

There is as much money in Canada to-day as at any time, but one trouble is that men are talking optimism and acting in the opposite manner. This will, however, help to make the growth of trade more stable as this lack of confidence is gradually disappearing. The trade conditions in the Maritime Provinces are good in every line, and there has been no reaction in business activities. The growth of trade in the East has all along been substantial and the leaks are few. All the business interests have not been so fortunate. Money has been spent that was not warranted, because people were living ahead of themselves. Let those who are talking optimism be optimistic. Believe in yourself, have faith in your country and its future possibilities. We have got down to a sure foundation. The depression has had its good effect. With the good outlook before us business will be built up upon a sure foundation, and renewed activity is not far away.

ADHERENCE TO SYSTEM.

Perfect harmony should exist between the personnel of a business establishment to ensure the best results from the combined efforts of all concerned. Much confusion and lack of harmony may be prevented by all those employed in the establishment having their duties and powers clearly defined. A system of management should be inaugurated and adhered to. Not even the manager should interfere with anyone on the staff, except through proper channels. Undoubtedly it is this interference or criticism coming from improper sources that is the cause of a good deal of the friction often noticed in different establishments.

In a contracting firm, according to systematic arrangement, the manager is responsible to the board of directors, the superintendents to the manager, the foreman on any job to the superintendent in charge, and the workman to the foreman. The wishes of the shareholders are conveyed to the workmen by their electing as directors men in whom they have confidence, by the directors employing a competent manager, by the manager choosing superintendents, and, perhaps, advising them in the employment of foremen, and the foremen hiring and directing labor. The manager will have no communication with the foreman, except through the superintendents, and a wise superintendent will never criticize the work on a job except to the foreman, else the foremen's authority will be depreciated.

What has been said refers equally to a manufacturing plant. A wise superintendent will give all orders through the foremen. All superintendents do not adhere to this; the result, system is demoralized, and the authority of the foremen destroyed.

In cases of dispute, decisions of the foremen will not carry weight; nor will they be regarded as final.

It is only when a manufacturing plant is thoroughly systematized that the best results are obtained. A good system is the first essential of a manufacturing plant; but a system must not be cumbersome. There should be systematic distribution of duties among the employes, from the manager down; there should be an efficient and accurate cost system; and there should be systematic handling of material from the time it enters the shop in the raw state until it leaves as finished product.

NICKEL STEEL FOR BRIDGES.

There has lately been presented to the American Society of Civil Engineers a long and elaborate paper entitled "Nickel Steel for Bridges," which may prove of great importance to Canadian interests. This paper, which it is expected will be issued in either the August or the September number of the society's "proceedings," describes an extensive series of tests, occupying over three years, comparing nickel steel with the carbon steel used at present for bridge construction. A complete set of specifications for designing and building nickel steel bridges is also developed, and diagrams are presented of weights of metal per lineal foot of span in both nickel steel and carbon steel for all the usual kind of single-track and double-track railway bridges. The paper concludes with an exhaustive economy study comparing the cost of nickel steel bridges and carbon steel bridges of all kinds, and for all lengths of span from twenty feet up to eighteen hundred feet, also for all possible conditions of the steel market, and for all practicable differences in the pound prices of nickel steel and carbon steel erected.

The result of this investigation and study is to prove that nickel steel is in every respect just as good and reliable material for bridge-building as carbon steel ; that in general it can properly be strained seventy per cent. higher ; that for the present conditions of the market in regard to steel and metallic nickel there would be a saving in cost of bridge superstructures varying from zero for very short plate-girder spans up to thirty per cent. for long cantilever spans ; and that, when in the future the increased output of nickel naturally reduces its cost per pound, the saving effected will be still greater. The percentage of nickel in the nickel steel advocated in the paper for bridge-building varies from three and a half to four and a quarter.

The importance of all this to Canada is two-fold. First, as the principal nickel mines in the world are located in this country, the great demand for that metal which would result from using it in bridge-building, causing it to be sold by the ton instead of by the pound, would develop here an immense industry and add largely to the country's wealth. And, second, by using the new alloy for rebuilding the Quebec bridge there could be saved thirty per cent. of the cost of its superstructure, or more than a million dollars.

The engineer who has made this investigation is Dr. J. A. L. Waddell, a Canadian by birth and a graduate of McGill University. He has designed and supervised the construction of many million dollars' worth of important bridges in the United States, Canada, Mexico, and several other foreign countries, and is recognized both from his structures aad his numerous technical books and papers as one of the highest authorities on bridge-building.

INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News.

Machine Shop and Foundry News.

The C.P.R. will erect a $20,000 machine shop at Saskatoon, Sask.

J. & R. Weir, Ltd., machinists, Montreal, have been registered.

Verzina & Chartier, founders, St. John's, Que., have been registered.

J. H. Hall & Sons, Brantford, Ont., are building a $3,500 machine shop.

Wm. & J. G. Greey's machine shop, Toronto, sustained a slight loss by fire.

The Marine & General Engineering Co., Sydney, N.S., is building new shops.

John Abrams & Son, Moncton, N.B., machinists, have lost their place by fire.

H. T. & H. P. Clarke intend opening a foundry and machine shop in Wetaskiwin, Alta.

The Galt, Ont., Malleable Iron Works are again running full time with an increased staff.

Wm. Malloch & Co., founders and manufacturers of elevators, London, Ont., has assigned.

The Louden Machinery Co., Guelph, Ont., intend establishing and equipping larger premises.

The New Glasgow Foundry Co. has laid a track from the works to connect with the I. C.R.

Fire caused a loss of $10,000 at the pipe shop of Dominion Iron & Steel plant, Halifax, N.S.

It is proposed to construct the National Rolling Mills plant at Sydney, N.S., at an early date.

R. G. and W. Noble, Markdale, Ont., have opened a machine shop in connection with their wagon shops.

Wm. Malloch & Sons, founders, machinists and manufacturers of elevators, London, Ont., have assigned.

The Canada Foundry Co. are building a couple of bridges for the T. & N.O. Railway in northern Ontario.

E. R. Hardendorf's machine shop, Brockville, Ont., was entered by burglars on June 15 and a few articles were stolen.

The Muskoka Foundry Co., Parry Sound, Ont., have enlarged their premises to keep up with the growth of business.

Alfred Vezina and Dosithe Chartier are opening up a foundry at St. John's, Que., to be known as Vezina & Chartier.

D. C. Patterson, lately with the Vulcan Boiler Works, will commence business on his own account, temporarily locating at Edmonds, B.C.

The Stock Exchange rumor has it that the Canadian General Electric Co. will likely sell the Canada Foundry to Canadian Northern capitalists.

Emerson & Fisher, proprietors of the Enterprise Foundry, are issuing a newspaper "once in a while," devoted to the interests of their stove business.

The Canadian Locomotive Works, Kingston, Ont., the only locomotive works on the continent that is busy, spent $465,000 last year in Kingston for wages.

The Hamilton stove-plate molders and their employers have reached an agreement. The general foundry day rate of wages of $2.75 being agreed to by the men.

Work on the G.T.R. shops at Stratford, Ont., is being pushed and new machinery has been installed. The shops at Pointe St. Charles, Que., may also be improved.

The Schnake Machine Works Co., New Westminster, B.C., have a $70,000 contract for supplying the machinery required for the Moresby Island Lumber Co's mill, Queen Charlotte, B.C.

The American Electric Furnace Co., St. Catharines, Ont., has installed a 200 horse-power induction furnace, which has a capacity of from 2,000 to 2,500 pounds of steel.

The Ontario Iron & Steel Works, Welland, Ont., opened on June 1, with a large force of men. The prospects for the future are bright. The following week the rolling mills started.

The contract has been let for the water-wheel and accessories in connection with the new pumping station at Sherbrooke, Que. The Jenckes Machine Co. is the successful tenderer.

The Marine & General Engineering Co., Sydney, C.B., are pushing forward the machine, boiler and forge shops. Structural material and boilers will be made and general marine repairs undertaken.

Wm. Kerr, president of the Kerr & Coombes Foundry Co., Hamilton, presented Carl Slingerland, of that concern, with a clock and mantel ornament on behalf of fellow employes on the occasion of his marriage.

The Silliker plant at Halifax, N.S., has commenced the building of railway cars. About 150 men are employed. Orders are pouring in. The foundry is working full time, and the machine shop is running to the limit.

Fire, supposed to be of incendiary origin, destroyed John Abrams & Sons' machine shop, Moncton, N.B., recently. This is the fifth time the Abrams concern has been visited by fire. The shop will be rebuilt at once.

It is reported that the Northey Engine Works, merged into the Canada Foundry Co., Toronto, about six years ago, will again become a distinct corporation. The Canada Foundry Co. officials, however, state that the rumor is without foundation.

George White & Sons, manufacturers of engines, etc., London, Ont., have taken out a building permit for a new foundry. Work will be commenced on the wood-working department, which is to cost $15,000, at once. The company will continue to run its old plant, as well as the new one. The new structure will be 100x200 feet.

The three machine shops of the Victoria Machinery Co. were totally destroyed by fire on June 7, $180,000 damage being done and 150 men being thrown out of work. The company showed commendable energy by opening up the following Monday morning, not even a day being lost. The temporary quarters are somewhat cramped, but they will serve until the new buildings are erected.

David Reid, formerly connected with the Canadian Westinghouse Co., Hamilton, Ont., has gone to Ingersoll, Ont., to become general manager of the Reid Foundry & Machine Co., which is taking over the business of the Ingersoll Foundry Co. The new firm will make castings for manufacturers who have no foundries of their own and will make a specialty of the Reid molding machine.

Electric Power and Transmission.

A rural telephone company is being formed at Airdrie, Sask.

Calgary, Alta., will spend $25,000 on electric light extensions.

A telephone line will be built from Barrie to Oro township, Ont.

Marchand Bros., electrical engineers, Montreal, have been registered.

Lindsay, Ont., may install an electric tapper for its fire alarm system.

A municipal telephone system will be constructed at Macdonald, Man.

An electric haulage system is being installed in the colliery at Reserve, C.B.

The Fort Pelly, Sask., Telephone Co. are planning extensions to their plant.

The Bell Telephone Co. is putting some of its wires underground in Peterboro.

Prince Albert, Sask., will replace its present street electric lamps with arc lights.

The Toronto Electric Light Company will erect a sub-station at a cost of $20,000.

A power house for the Prince Edward Island Railway will be erected at Charlottetown.

Hamilton, Ont., will until August 3 receive tenders for about 900 electric street lamps.

Merritton, Ont., has decided to construct a municipal electric light plant to cost $5,550.

Ingersoll, Ont., will contract for 500 horse-power with the Hydro-Electric Power Commission.

A new electric haulage system has been installed in the French Slope colliery at Reserve, C.B.

The C.P.R. will electrify its line between New Westminster and Westminster Jct., B.C., next year.

The C.P.R. is experimenting on its cars in British Columbia with electricity for lighting purposes.

The Eastview, Sask., Telephone Company are contemplating the erection of a number of rural telephone lines.

Toronto will establish an electrical construction development with a consulting board of three experts.

The Markham & Pickering Telephone Co., Markham, Ont., will construct a number of long-distance lines.

The South Leeds and Pittsburgh Rural Telephone Co., Gananoque, Ont., will soon construct an up-to-date system.

Winnipeg's power scheme, on which half a million dollars has already been spent, will be pushed ahead to completion.

The Saskatchewan Telephone Company, Moose Jaw, Sask., will shortly build to the boundary line, a distance of 75 miles.

The Bull River Power & Light Co., Fort Steele, B.C., will erect a $10,000 h.p. plant on Bull River, near that place.

The ratepayers of Ladysmith, B.C., have approved a by-law to borrow $25,000 for the installation of an electric light system.

The town council at Macdonald, Man., have decided to proceed immediately with the construction of a municipal telephone system.

C. H. Mitchell, C.E., Toronto, is investigating power projects for Huntsville, Ont., and will report upon a hydro-electric installation.

The Toronto and Niagara Power Co. will not enter Brantford at present, though its line is completed between Hamilton and Cainsville.

It is likely that the question of municipal ownership of the electric street railway will be submitted to Kingston ratepayers next January.

The H. W. Johns-Manville Co., New York city, electrical supplies, have leased the Crucible Steel Co.'s building, Toronto, for a branch factory.

The Westmoreland Power Co., Moncton, N.B., are seeking incorporation to construct a street railway and to carry on a light and power business.

Electric motors will operate the gates on the Welland canal in future, thus saving three hours in the passage between Lake Ontario to Lake Erie.

The Orangeville, Ont., Flour Mill is now being operated by electricity, the motors being made by the Canadian Westinghouse Co., Hamilton, Ont.

The offer of the Robert Company to supply light cheaper than the present figures Montreal is paying has been accepted by the city council of that city.

The time for submitting tenders for transmission lines between Niagara Falls and Toronto, and Niagara Falls and St. Thomas has been extended to July 15.

The Northern Electric Co., Montreal, have been awarded the contract for the supply of 700 miles of long distance telephone material for the Province of Alberta.

The ratepayers of Merritton Ont., will on July 6 vote on a by-law to raise $10,000 for the purpose of purchasing the Merritton Electric Light Company's plant.

The St. Thomas, Ont., Traction Co. is putting in a rotary converter and transformer at Union. The stations at Lambeth and St. Thomas will also be strengthened.

The Cranbrook, B.C., Electric Light Co. propose to build a hydro-electric plant on St. Mary's river to supply Cranbrook, Morgie and Marysville with light and power.

Edmonton, Alta., will supply electricity for lighting purposes to the Swift packing plant, but the concern will install a large power plant for the operation of the machinery.

The United Telephone Co., Russell, Man., have been granted a franchise to erect a rural telephone system throughout Silver Creek municipality and work will commence this summer.

The Canada Zinc Co., Nelson, B.C., will take 1,000 horse-power from the West Kootenay Power & Light Co., to operate its works. The pole line, two miles long, is now being constructed.

Traffic through the St. Clair tunnel between Sarnia, Ont., and Port Huron, Mich., is now being hauled by electric motors, which handle 50 per cent. more tonnage at 30 per cent. greater speed.

North Bay, Ont., has applied to the Hydro Electric Commission for permission to develop Smoky Falls on the Sturgeon river, 18 miles away. The falls are capable of eight or ten thousand horse-power.

The Ontario Distribution Co., St. Catharines, Ont., is seeking a by-law from Lincoln county to construct an electric line from St. David's along the Queenston and Grimsby road to a point where the Michigan Central crosses that road.

E. W. Backus, Fort Francis, Ont., promoter of the Rainy river dam, was in New York arranging for the financing of the proposition. The Rainy River Improvement Company has already spent about $900,000, and wants to spend $4,000,000 more.

The contract for the 500 kilowatt steam turbine generating unit for the town of Moose Jaw, Sask., has been awarded to the Canada General Electric Company at $36,431. Allis-Chalmers-Bullock also tendered at $45,754, and the Canadian Westinghouse Company at $45,054.

The Robert Syndicate, Montreal, will build their power house at St. Timothee, where there is a head of 51 feet 7 inches. They will begin with 6,000 h.p. and increase it until they have 60,000 from the water coming through the Beauharnois canal from Lake St. Francis. This, with the 40,000 available horse-power at Cedar Island, where the Robert Co. has secured the rights, will make a total of 100,000 horse-power.

The Manitoba Provincial Telephone Department has let the following tenders for supplies to be used in construction work this year. In each case the lowest tender has been accepted: The contract for the wood side brackets was let to the Northern Electric Co., of Winnipeg. Cross-arms, E. Vessel & Sons, Toledo, O., and Northern Electric Company. Top-pins, Northern Electric Company. Insulators, Northern Electric Company. Copper wire, Wire & Cable Company, Montreal. Copper sleeves, F. B. Cook, Chicago. Weatherproof iron wire, Canadian General Electric, Montreal. Steel strand wire, W. E. Skinner, Limited, Winnipeg. Pole line hardware, Northern Electric Company.

Saw and Planing Mills.

Arthur Sewell is erecting a sawmill at Gibson, N.B.

L. Christie, Fort Frances, Ont., is erecting a tie mill.

The Cooke Lumber Co. will erect a sawmill at Nelson, B.C.

A. Todd, Walkerton, Ont., will erect a sawmill, at Guelph, Ont.

The Lindsay Planing Mill was burned on June 10. Loss $5,000.

M. W. White & Co., will erect a mill at Beaver Cove this year.

C. J. Moore, Victoria, B.C., will erect a sawmill at Prince Rupert.

A large sawmill will be erected at Dryden, Ont., by the Louis A. Fisher Co.

Cragg & Austin are rebuilding the sawmill burned down some short time since.

Taylor & Jamieson, Scotstown, Que., will rebuild their sawmill, lately burned.

The St. Lawrence Lumber Co. will erect a new $150,000 mill at Dalhousie, N.B.

The Rainy River Lumber Co. will erect a large sawmill at Fort Frances, Ont.

The sawmill of F. D. Sadlier, Rowena, N.B., was destroyed by fire at a loss of $5,000.

The Wm. Scott Lumber Co.'s sawmill, near Fredericton, N.B., was destroyed by fire.

P. Kyle's saw and flour mills, Merrickville, Ont., were burned on June 3. Loss $5,000.

The Danville, Que Lumber Company's sawmill has been burned down. Loss, $25,000.

The Renous Bridge Lumber Co.'s sawmill at Millerton, N.B., has started operations again.

Gibson & Robson, Tynchead, B.C., have bought the Serpentine Lumber Co.'s business.

Nicol Bros.' sawmill, near Owen Sound, Ont., was destroyed by fire on June 8. Loss $3,000.

Taylor & Jamieson will rebuild their sawmill at Scotstown, Que., on an extended scale.

Tilton & Raymond's steam shingle mill at Smith's Mills, Que., was totally destroyed by fire.

A. G. Bishop's sawmill at Conn, Ont., was completely destroyed by fire on June 8. Loss $4,000.

The premises of the Danville Lumber Co., Montreal, were destroyed by fire. Loss about $12,000.

Cragg & Austin are building a new sawmill at Kinmount, to replace the one burned last winter.

W. T. Farrell is removing his large sawmill from False Creek, near Vancouver, to the Capilano river, B.C.

The John Carew Lumber Co.'s mills at Lindsay, Ont., were burned on June 8, $14,000 damage being done.

W. L. Clark will operate the Wetaskiwin, Alta., planing mill, in connection with his foundry business.

The Danville Lumber Co.'s sash and door mill, at Danville, Que., was damaged to the extent of $12,000 by fire.

A sawmill, in which S. G. Fitzpatrick, of St. John, N.B., is said to be interested, will be built at Oromocto, N.B.

D. McKackon's entire planing and stave mill at Highgate, Ont., has been destroyed by fire. Loss, about $10,000; insured for $4,000.

A. Cushing & Co.'s lumber mill business at Moncton, N.B., is being turned into a joint stock company with a capital of $350,000.

The sawmill of H. A. Crate, at Lombardy, Ont., near Smith's Falls, has been completely destroyed by fire, with all the machinery.

The Eastern British Columbia Lumber Co., Ltd., Fernie, B.C., is making extensions to the plant and completely overhauling the mill.

The North American Land and Lumber Co., Dubuque, Iowa, operating the Cedar Valley mill, Fernie, B.C., will enlarge their plant.

The Domville Lumber Co., Montreal, lost part of their plant by fire, the loss being $16,000. Rebuilding operations are already going on.

The large sawmill at Bathurst, N.B., belonging to the Bathurst Lumber Co., was destroyed by fire, including a quantity of new machinery.

Geo. Tennant has purchased the Bracebridge, Ont., Furniture Co.'s factory, and will convert it into a sawmill and woodworking factory.

It is stated that Field Brothers, of Victoria, have purchased fifty sections of timber land in the vicinity of Bella Coola, B.C., and that a syndicate is being formed for the erection of a large sawmill this season.

The Selkirk Saw and Planing Mill, Warsaw, Ont., began operations for the first time on the 12th inst. The planing department will start up in a few days.

The timber limits, sawmill, etc., of the East Templeton Lumber Co., Limited, East Templeton, Que., will be sold by public auction at Ottawa on September 15th next.

Robert Watt, Toronto, will erect a planing mill and factory at the corner of Campbell Avenue and Tennyson Avenue, Toronto, and establish a general lumber business.

Willis & Co., Ltd., Montreal, will erect a new piano factory at St. Therese, 20 miles from Montreal. The building will be brick and concrete, with sawmill, etc., and the most modern machinery will be installed throughout.

A. Joncas has completed his new lumber mill on the outskirts of Sherbrooke, Que. The mill is thoroughly up-to-date in every respect, and derives its power from electric motors placed in different parts of the building.

M. J. Scanlon, of the Scanlon-Brooks Lumber Co., Minneapolis, the largest individual lumber operator in the United States, next to Weyerhauser, has closed a deal in Vancouver for the purchase of forty-seven limits in the Harrison Lake district. He is paying $520,000 for the timber. Next year he will construct two mills, one at Harrison and one at Vancouver, to jointly cut 350,000 feet of lumber per day, and to cost $750,000 for the plants.

D. Van Wagener, of London, Eng., and J. G. Fitch, of Los Angeles, Cal., have completed a timber deal involving 250,000,000 feet of lumber, comprising cedar, fir, hemlock and spruce, on a site four miles from Vancouver, B.C., being on Manquim creek, on the Squamish valley, and will build three large mills. One of the sellers is J. McShane, of Vancouver. The new plant will be erected on the limit, and the raw lumber will be conveyed in flumes. Trade will be opened up with the Orient and Australia, and the cyprus cut will be shipped direct to California.

Railway News.

The C.P.R. storehouse at North Bay was burned.

Sydney, N.S., proposes to extend its tramway system.

Work on Calgary's (Alta.) street railway will be started at once.

The Hamilton Street Railway Co. will greatly extend its service.

Work has commenced on the G.T.P. bridge at Fort William, Ont.

The Brantford and Hamilton Electric Ry. is now open for traffic.

Muskoka, Ont., has been made a divisional point on the C.P.R.

A railway line is proposed to be built in the Goat River canon, B.C.

The C.N.R. will this summer lay rails on the Goose Lake line extension.

The C.P.R. line between Lanigan and Saskatoon, Sask., is completed.

The Canadian Northern Ry. bridge at Cowan, Man., was destroyed by fire.

Revelstoke, B.C., may be a traffic point for G.T.P. construction supplies.

The C. P. R. is laying track on its Walkerton and Lucknow Ry. branch.

The G.T.R. will relay all rails in the London, Ont., yards this summer.

The C.P.R. is pushing out a new branch from Moose Jaw, Sask., northwesterly.

The G.T.R. is experimenting at London, Ont., with a new fire door for engines.

The C.P.R. is relaying 159 miles of track between Winnipeg and Souris, Man.

The C.P.R. is replacing the old-fashioned handcar with one run by gasoline.

Work is now in progress on the Nepigon, Ont., section of the Transcontinental Ry.

The Port Arthur, Ont., street railway will extend its system six and a half miles.

The C.N.R. is this summer constructing the Delmeny-Carleton branch, in Saskatchewan.

The Canadian Northern is connecting its various lines centering at Prince Albert, Sask.

The Montreal & Southern Counties Ry. may enter Montreal and carry freight, but not passengers.

The Spokane & British Columbia Railway will this summer build further into the mining country.

The C.P.R. will build 200 miles of road between Hardisty, Alta., and the Battle River, this summer.

The freight and coal sheds of the I.C.R., Bathurst, N.B., have been destroyed by fire. Loss, $15,000.

The G.T.R. is relaying the rails on the main line between Montreal and Brockville, Ont., with 100-lb. steel.

The Great Northern Railway Co. propose extending the Crow's Nest Southern to Calgary, from Michel, Alta.

The G.T.R. expect to be a factor in this year's crop-carrying business between Saskatoon and Winnipeg.

The C.P.R. will extend a branch from Moose Jaw northwest to Outlook, a distance of 123 miles, immediately.

The Toronto Railway Co. offer to run a line to the docks if the city builds a bridge across the railway tracks.

An electric railway between Brockville and Ottawa is almost an assured fact. English capitalists are interested.

It is expected to relay about 38 miles of G. T.R. track between London and Sarnia during the present summer.

The Moose Jaw, Sask., Board of Trade is trying to secure the early construction of the C.N.R. line to that town.

The C.P.R. intend to build the 200 miles of road between Battle River and Hardisty, Alta., during the summer months.

McCoy & Wilford, Lindsay, Ont., have a 30-mile contract for construction on the Transcontinental in New Brunswick.

There is talk of extending the Berlin, Galt, Preston & Hespeler electric railway system out to Puslinch Lake from Hespeler.

A contract has been let for the new line of the C.P.R. between Lethbridge, Alta., and MacLeod: estimated cost $500,000.

Buffalo and Toronto electric railway magnates propose building a steel bridge across the Niagara River at Niagara Falls.

The E. & N. Railway will build its Cowichan Lake, (B.C.) branch if the lumber companies give assurances of future business.

It is stated that the contract for the St. Mary's-London section of the North Midland Electric Railway will shortly be let.

The I.C.R. will bore an artesian well at St. John, N.B., to supply water for the railway buildings there and for its locomotives.

The C.P.R. is now running regularly over its Toronto-Sudbury line and through trains are in operation between Toronto and Winnipeg.

Farmers about Battleford, Sask., are petitioning the C.N.R. to construct its proposed line from Battleford to Athabasca Landing.

The E. & N. Railway will construct steel bridges across the Nanaimo and Chemainus rivers in British Columbia, without delay.

The St. Mary's & Western Ontario Ry. is completed as far as St. Mary's, Ont. The whole line is expected to be open on July 1.

Early in July the G.T.P. will require 5,000

men for ballasting the western sections, and 2,000 on the Fort William section of the road.

The C. W. & L. E. electric line is now open through to Lake Erie. An extension northward to Petrolea is understood to he next in order.

The C.P.R. is operating a steam motor car suburban service between Toronto and Brampton, and may extend the service to other branches.

The G.T.P. is laying steel in the Eagle Hills, east of Saskatoon, Sask., at the rate of four miles per day. The line to Winnipeg will soon be completed.

Dunnville, Ont., passed a by-law to purchase $30,000 of Dunnville, Wellandport and Beamsville Railway bonds to assist in the construction of that railway.

The prospects of building the Hamilton, Waterloo and Guelph Ry. this summer do not appear bright, owing to the inability of the company to float its bonds.

A. T. Goward, manager of the British Collumbia Electric Railway Company at Victoria, B.C., states that the concern will expend $2,000,000 upon extensions in and around that city.

The New York Central and Canadian Pacific will construct ferry slips at Prescott, Ont., similar to that built at Ogdensburg, N.Y., by the Rutland R. R. The slips will cost $150,000.

The Stanley Railway & ...g. Co., Ryan's Brook, N.B., may take over the York and Carleton Railway and extend it eight miles to connect with the G.T.P., near Napidoggan Lake, N.B.

The Temiskaming & Northern Ontario Railway is pushing coustruction work, and has rails down 217 miles north of North Bay and but 35 miles south of the National Transcontinental.

The Toronto Construction Co. has been awarded the contract for the construction of the G. T.P. from Tohique river to the junction of the Canada Eastern, near Cross Creek, N.B., ahout 64 miles.

The British Columbia Ry. Co. has let to Boyd & Craig the contract for the construction of the first section of the Chilliwack line, at ...00,000. The company hope to open the road next February.

Considerahle extensions are said to he planned on the Brandon-Regina line by the C.N.R. It is stated that several of the old stations are to be replaced by fine new buildings, and further, that the road is to be generally ballasted and improved.

The Dominion Government has been asked to construct a new line around the Cohequid Mountains in Nova Scotia, so that I.C.R. trains may avoid the present excessive grade hetween Halifax and St. John.

The Intercolonial Railway last week inaugurated an iced car service for fresh fish to Montreal and hereafter on every Tuesday a refrigerator car will leave Mulgrave, N.S., and another will leave Halifax.

Instead of building a Hudson Bay line the Dominion Government is making arrangements with the Canadian Northern Railway, which already has a road completed to Le Pas Mission, 480 miles from Fort Churchill.

A Canadian Pacific engineering outfit has arrived at Virden, Man., to locate the new line to McAuley, and has camped six miles northwest of town. The Canadian Northern Railway party is also surveying a road in the same direction.

According to C. M. Hays, construction on the Kingston Smith's Falls and Ottawa Railway will be pushed as soon as money is available. In this connection the G.T.R. will undertake extensive and important improvements at Kingston, Ont.

The Port Arthur, Ont., Electric Railway and Light Commissioners were recently authorized to immediately proceed with the double-tracking of the electric railway on the portion lying between Current River Park and the southern boundary of the city.

Harry A. Gibson, Marysville, N.B., has the contract for supp... 350,000 railway ties for the Toronto Construction Co.'s section of the G.T.P. between Plaster Rock and Chipman, N. B. He will also supply the telegraph poles for that section, as well as clear the right of way.

The Grand Valley Railway is extending its rails from the main line between Brantford, Paris and Galt, to St. George, Ont. A large numher of men are employed in the work. It is also the intention of the company to reconstruct the main line and to make big improvements and extensions in its system in Brantford during the coming summer.

An order for 2,500 tons of steel rails for use on the Grand Trunk Pacific Railway, from the Prince Rupert end, were recently shipped by a long route. These rails were made at Pittsburg and shipped to New York, thence across the Atlantic, through the Suez canal and Indian Ocean and up the Yellow Sea to Kope, and there laden on the Blue Funnel line steamer Tencer, thence taken across the Pacific to Vancouver.

A large numher of new sleeping and dining cars will he put in commission by the Canadian Pacific Railway shortly. Eighteen new sleepers and six new dining cars are now heing built for the western lines in the shops of the company in Montreal. All of these cars are being huilt according to the latest plans, and no expense will he spared in their furnishing or equipment. They will he used on the main line between Montreal and Vancouver.

The Vancouver Island and Eastern Railway Company are applying for a charter. This company was organized last year to huild a railway from Esquimalt harbor, Vancouver Island, north to Seymour's Narrows; and from Bute Inlet or Frederick Inlet on the mainland of British Columhia, east via Yellowhead Pass to Edmonton, ahout 900 miles. The provisional directors include, T. W. Paterson, T. J. Jones, R. C. Lowe and H. A. Munn, Victoria; James Smith, Edmonton, and M. J. Harvey, Toronto.

General Manufacturing News.

Towgood & Bruder's brewery, Sandon, B.C., was hurned.

The Peterhoro, Ont., Cereal Co.'s plant was hurned recently.

The Granhy Smelter, Grand Forks, B.C., is improving its plant.

P. L. Robertson's screw factory, Milton, Ont., is almost complete.

A. J. McArthur will build a tile works factory at Calgary, Alta.

The Dominion Pressed Steel Co., Ltd., Toronto, have assigned.

A large peat fuel plant will be established in Caledonia Springs, Ont.

Walker & Son have started a sash and door factory at Rosthern, Sask.

The Aubes Air and Smoke Consumer Co., of Montreal, has been registered.

Walter Tyrrel, Lindsay, Ont., will start a factory to make wooden limhs.

The Edmonton Cement Co., Red Deer, Alta., intend erecting a cement works.

The Sydenham Glass Co., Wallaceburg, Ont., is building a new $60,000 factory.

The Canadian Canners Co. will erect a large canuing factory at Ridgetown, Ont.

The British Columbia Pottery Co. will build a pottery plant at Burnahy, B.C.

Brown, McMillan & Calder will erect a sash and door factory at Welland, Ont.

W. J. Meyers, Toronto, will erect a workshop for the manufacture of brewers' casks.

Brahant's Brass Works, Detroit, Mich., will erect a branch factory at Windsor, Ont.

Prominent Vancouver men are planning new iron works on the outskirts of that city.

Oil Springs, Ont., has granted a bonus of $2,060 for the establishment of a flax mill.

The Wallaceburg, Ont., Sugar Co. is spending $40,000 on enlargements and improvements.

D. J. McCuan, Renfrew, Ont., will probably establish a cement works at Fourth Chute.

Geo. White & Sons, London, Ont., will erect a machine shop at a cost of ahout $15,000.

The Imperial Wire & Steel Company's plant, at Collingwood, will be extended this season.

The Royal City Gas Improvement Co., New Westminster, B.C., may erect a $150,000 plant.

A. E. Petty, of Hamilton, Ont., will establish an emery wheel factory in Brantford, Ont.

A. R. Fleming, Regina, Sask., is considering establishing a brick plant at Tantallon, Sask.

The Eureka Refrigerator Co., Toronto, have purchased the old Palmer Piano Co.'s factory.

The plant of the Imperial Wire and Steel Co., Collingwood, Ont., will be extended this season.

A. A. Barthelmes, Toronto, will build a concrete factory for manufacturing piano actions, etc.

E. N. Heney & Co., Montreal, will huild a new carriage factory at a cost of about $80,000.

The Dominion Coal Co., Glace Bay, N.S., will rebuild their washing plant recently destroyed by fire.

The Canadn Mill Stock & Metal Co., Toronto, has purchased a new site for a factory addition.

The C.P.R. is considering erecting a number of grain elevators at various points in the west.

The Stanley Railway and Manufacturing Co. will erect a woodworking factory at Ryan's Brook, N.B.

Loftus Bros. are putting up a plant near Boundary Falls, B.C., for the manufacture of fruit boxes.

The Waterman Pen Co. will erect a factory at St. Lamhert, Que., this summer at a cost of ahout $50,000.

The Dane Farm Implement Mfg. Co., of Iowa, are considering erecting a $40,000 plant at Port Robinson, Ont.

Small Bros. have hought and are re-opening the old wagon-making works of Wm. Platt, Niagara-on-the-Lake, Ont.

A large plant to cost in the neighhorhood of $250,000, will he erected at Niagara Falls, by the American Cynaid Co.

The Enamel Concrete Co., Des Moines, Iowa, will prohahly huild a factory for making enamel hricks at Vancouver, B.C.

The paper and hox-making factory of T. N. Hibben & Co., Victoria, B.C., has been destroyed hy fire. Damage, $75,000.

The International Co., Coleman, Alta., is building forty new coke ovens, which will give the concern a hattery of 216 ovens.

The International Lighting & Heating Company will erect three brick buildings for their new gas plant at Brandon, Man.

A. R. Fleming, Regina, Sask., is considering the establishment of a brick plant in Tantallon, Sask., at a cost of about $10,000.

C. V. Wetmore and F. A. Crowell have secured enough money to construct the proposed National Rolling Mills at Sydney, C.B.

One of the paper mills of the Lincoln Paper Mills Co., St. Catharines, has been destroyed by fire. Loss, $85,000; insurance, $65,000.

J. C. Sullivan, at the head of a $200,000 company, will erect a factory for making brick, tile and sewer pipe at Fort Frances, Ont.

An American concern, capitalized at $100,000, has asked for a free site at Niagara Falls, Ont., on which to erect a steel rolling mill.

The British-Canadian Wood Pulp and Paper Co., Port Mellon, B.C., is calling for tenders for the proposed cement buildings of the concern.

W. T. Crocker, Detroit, Mich., is negotiating with the Galt, Ont., council, with a view to the erection of a large automohile factory there.

The H. W. Johns-Manville Co., New York City, electrical supplies, have leased the Crucible Steel Co. building, Toronto, for a branch factory.

The Percy & McPherson Brass Works will erect a factory in Forest, Ont., on condition that the town will exempt them from taxation for ten years.

The Brydges Engineering and Supply Co, Ltd., is the name of a new Winnipeg firm going into railway and contractors' supply business on an extensive scale.

The restoration of the Winnipeg Paint & Glass Co.'s warehouse, Winnipeg, has begun. The work will be of reinforced concrete, and will cost $40,000.

The Vancouver Sash and Door Factory has secured a site from the C.P.R. for the erection of a new plant, and plans for the building are now being prepared.

The Foley & Gardiner Manufacturing Co. have leased a factory on Orillia Street, Toronto, for the manufacture of meat and bandsaw filing and jointing machines.

A honus of $5,000, with exemption from taxes for ten years, has been granted by Sherbrooke, Que., to the Improved Paper Machinery Co., of Nashua, N.H., who will establish a plant there.

The factory, site, buildings and water power privileges of the Canada Cabinet Co., Limited, Gananoque, Ont., will be disposed of by public auction this month, the company heing in liquidation.

A. T. Hunter, Regina, Sask., states that a 00-barrel flour mill and 100-barrel oatmeal mill will be erected this summer in place of the Regina Flour Mills Company's plant, recently destroyed by fire.

The Improved Paper Machinery Co., of Nashua, N.H., has decided to locate their Canadian factory at Sherbrooke, Que., and will begin operations at once. The city will give them a honus of $5,000, with exemption of taxes for 10 years.

The Calgary, Alta., electric light committee has recommended the $20,226 tender of the Robb Engineering Co., Amherst, N.S., for a cross compound engine; and that of the Allis-Chalmers-Bullock Co., Montreal, at $15,980 for a generator and exciter.

Waterworks and Sewage.

Taber, Alta., will install a water system.

Chatham, Ont., will extend its sewerage system.

A sewerage system will be installed in Bridgeburg, Ont.

The Rectory Street sewer, London, Ont., has been begun.

Work has commenced on Longueil's, Que., sewerage system.

Ladysmith, B.C., proposes to construct a sewerage system.

Vancouver may spend $300,000 on a waterworks system.

A number of sewers will be constructed in Owen Sound, Ont.

Montreal will spend about $50,000 on waterworks improvements.

A number of sewer extensions will be made in Perth, Ont., this year.

A number of sewer and water extensions are proposed for St. John, N.B.

A waterworks system to cost $5,000 may be installed at Melbourne, Que.

Cobalt, Ont., contemplates constructing a waterworks and sewage system.

The sewerage and waterworks systems, Dartmouth, N.S., will be extended.

Westmount, Que., will expend $25,000 on roadway and drainage improvements.

Glace Bay, N.S., ratepayers have voted $30,000 for water service extensions.

Ville Marie, Que., will spend about $27,000 on waterworks and sewerage systems.

A storm sewer is proposed to be constructed on Dalhousie Street, Brantford, Ont.

Grandview residents are asking for an extension of Vancouver's sewerage system.

Nanaimo, B.C., is expected shortly to begin work on its [illegible] waterworks system.

A filtration plant will be installed at Kettle Creek, St. Thomas, Ont., for the sum of $30,000.

Waterloo, Ont., ratepayers have approved of a by-law to expend $5,000 on waterworks extension.

Palmerston, Ont., is driving a waterworks well, and a waterworks system will be installed shortly.

The town council, Welland, Ont., have decided to spend $50,000 on the sewerage system this summer.

The council of Moose Jaw, Sask., are considering by-laws to the amount of $150,000 for electric light plant, sewer and water systems.

Victoria, B.C., is advertising for tenders for the supply of steel-riveted pipe and for two electric-driven power pumps for its waterworks system.

Willis Chipman, civil engineer, Toronto, is to make a report on the best system of waterworks and sewage to install in the town of Dauphin, Man.

It has been decided to submit a by-law to provide $83,000 for improvements and extensions to the electric light and waster plants at Estevan, Sask.

The ratepayers of Regina, Sask., have carried the following by-laws: $90,000 for waterworks, $10,000 electric light purposes, $70,000 for sewerage purposes, $5,000 for sidewalks, $25,000 for pavements.

The Guelph, Ont., water commissioners have awarded the following contracts: For cast iron pipe and special pipe, the Gartshore, Thompson Co., Hamilton; for hydrants, valves and valve boxes, the Kerr Engine Co., Walkerton.

Municipal Undertakings.

A new steel bridge will be erected at Blyth, Ont.

A new steel bridge will be erected at Gorrie, Ont.

New Westminster's barbor works will cost $3,250,000.

Regina, Sask., contemplates erecting a cold storage plant.

A $100,000 bridge will be built over the Ottawa river, between Hawkesbury and Grenville.

Winnipeg wishes to submit a by-law authorizing the expenditure of $50,000 for placing wires underground.

Several new bridges will be erected this season in the district about Sheho, Sask., by the Provincial Government.

A new bridge, estimated to cost $41,500, may be erected across the Assiniboine river, near Portage la Prairie, Man.

The ratepayers of Richmond, Que., will probably be asked to vote on a by-law to spend $20,000 for the construction of sidewalks.

The public school trustees of Mimico, Ont., will install a new heating system in the Mimico Avenue school this summer, at a cost of $2,000.

A number of residents of Sydenham, Ont., are making application to the Dominion Railway Commission for the erections of an overhead bridge across the C.P.R. tracks near Owen Sound.

Tenders will be received up to July 8 by Fred. Gelinas, secretary, Department of Public Works, Ottawa, for the construction of a moveable dam, steel service and highway bridge, repair shop, etc., at St. Andrew's Rapids, Red river, Man.

Trade News

Winnipeg will spend $600,000 on its pub- schools.

The Kerr Engine Co., Walkerton, will supply Guelph's waterworks with hydrants, valves and valve boxes.

J. C. Fell & Co., Toronto, Ont., have moved their stamp and stencil works from 84 Adelaide St. W., to 137 Church St.

The Twin City Coal Co., of Edmonton, Alta., have recently purchased an 80 horse-power Robb-Mumford water tube boiler.

W. J. Dalton, the pioneer foundryman of West Toronto, Ont., is now in his new foundry, situated at 290 Davenport Road.

F. Reddaway & Co., Montreal, manufacturers of Camel brand belting, has removed to more convenient offices at 56 St. Francois Xavier St.

The John Inglis Co., Toronto, was the successful tenderer for the installation of the pump in Guelph's, (Ont.) waterworks system. The tender amounts to $14,000.

M. D. Tillman, representing the Honeywell Heating Specialty Co., Wabash, Ind., is locating in Montreal, where his company is establishing a Canadian factory.

The Dominion Coal Co., of Glace Bay, C.B., have recently ordered a 16"x16" Robb-Armstrong automatic engine for driving a mine-ventilating fan at their No. 6 colliery.

The Manitoba Telephone Department has given the tender for copper wire to the Wire and Cable Co., Montreal, and weatherproof iron wire to the Canadian General Electric, Montreal.

The tender of the John McDougall Caledonia Iron Works Co. for two accumulators for the low-level pumping station of the Montreal city waterworks, has been accepted, the price being $5,111.

Philip Mfg. Co., Toronto, Ont., room molding and picture frame manufacturers, have moved from Lake and Lorne Streets to Carlaw Avenue.

The Hill Electric Switch Co., 1560 St. Lawrence Boulevard, Montreal, has been merged into the Hill Electric Manufacturing Co., Montreal. J. J. Dougherty is manager of the new company.

Max Bachem, 116 Adelaide St. W., Toronto, Ont., who opened a shop for expert automobile repairing about February the first, has already found it necessary to make an extension to the rear of his place.

Huntingdon, Que., council has awarded the tender for a new white pine tank to the Canadian Fairbanks, Montreal. The tank will have a capacity of 50,000 gallons and will be erected on a steel tower 50 feet high.

The Northern Electric, Montreal, has been awarded the contract for 700 miles of long distance telephone material and supplies in Alberta, and the hardware, insulators, telephones and crossarms for the Manitoba telephone system.

The Canada Machinery Agency, Montreal, W. H. Nolan, proprietor, has purchased the machinery and other equipment of the International Steel Co. and Eagle Foundry, and is placing it on the market. Some of the machinery is new.

The Northern Aluminium Co., Shawinigan Falls, Que., which has been closed since last November, was re-opened on June 11th. The company has resumed operations with 100 men and will increase its force until their regular force is employed.

The Beaver Lock and Machine Works, 117 Bay St., Toronto, have added quite an extension to the rear of their shop, and also enlarged their office. This firm manufactures all kinds of window columns, keys, concrete tools and metal patterns, as well as doing general machine work.

From orders reported the Kerr Turbine Co., Wellsville, N.Y., must be busy. They say: "Reports from the engineering salesmen in the larger commercial centres, as well as the inquiries coming direct to the home office, indicate a rapid and real improvement in business conditions."

The Railway Mfg. Co., incorporated under the laws of New Jersey, with offices in New York, has purchased the United States and Mexican patent rights of the Clark patent automatic nutlock from Dinning & Eckenstein, Montreal, for the sum of $45,000 and a percentage of stock in the Railway Mfg. Co.

The Dominion Bridge Co., of Lachine, have been awarded the contract for the superstructure of the Granville Street and West Avenue bridges over False Creek, Vancouver, B.C. The weight will be about 2,800 tons and cost three-quarters of a million dollars. They will also erect the steel work of the new Fort Garry station at Winnipeg, to be occupied by the G. T. P. and C. N. R.

The St. Clair Foundry Co., 232 St. Clair Avenue, West Toronto, Ont., who went in business a little less than two years ago, have already found it necessary to put an extension on their foundry. They have installed a new outfit of flasks, as well as more foundry equipment. Besides doing general jobbing work and manufacturing plumbers' supplies, they are the only firm in Canada making Scotch axle boxes.

The Western Fuel Co., of Nanaimo, B.C., have recently purchased a 90-in. double inlet half-housed Sirocco mine-ventilating fan, having a capacity of 200,000 cubic feet per minute, at 275 r.p.m., or 300,000 cubic feet of air per minute at 405 r.p.m. This fan will be built by the Robb Engineering Company, of Amherst, N.S., who have made arrangements with the Sirocco Engineering Company, of New York, to manufacture their fans in Canada.

The Independent Pneumatic Tool Co. has a complete exhibit of their Thor piston air drills and reamers, pneumatic flue rolling, tapping and wood boring machines, portable pneumatic grinding machines, pneumatic chipping, calking, beading and riveting hammers, pneumatic wood saws, hose, couplings and other air appliances at the Railroad Master Mechanics' and Master Car Builders' conventions, held at Atlantic City, New Jersey, from June 17th to June 24th, inclusive.

Building Notes.

A $10,000 telephone exchange will be erected at Strathcona, Alta.

Sir John Langman will erect a $40,000 warehouse at Calgary, Alta.

The Y.M.C.A. are considering the erection of a new building in Toronto.

A new Manufacturers' Building may be erected in the Toronto Exhibition grounds.

The Dominion Government has voted $50,000 for the penitentiary building at Prince Albert, Sask.

A trades building will be erected in connection with the Institute for the Blind by the Provincial Government at Brantford, Ont.

Companies Incorporated.

The C. H. Lepage Co., Ltd., Quebec: capital, $45,000; to engage in foundry business. Directors, C. H. Lepage, E. Rosseau, A. Theriault, J. H. Fortier and J. Asselin.

Messrs. Trudel & Graham, Montreal: capital, $20,000; to manufacture hats, caps, furs, etc. The charter members include C. E. Simpson, A. Trudel and A. Giguere, Montreal.

The Wallace Bell Co., Ltd., Montreal; capital, $45,000; to engage in well-drilling. Directors, W. Bell, Sarah A. Bell, Jno. Bell, Wm. Bell and R. Bell, all of Montreal.

The Rice-Knight Manufacturing Co., Limited, Toronto; capital, $50,000; to manufacture lamps, etc. Provisional directors: H. A. Rice, E. H. Scammell and F. E. de Garmo.

Guardian Shoe Co., Montreal; capital, $40,000; to manufacture boots, shoes, rubbers, etc. The charter members include B. Gale, W. Patterson, Montreal, and H. Gale, Quebec.

The Watson-Smith Co., Ltd., Toronto; capital, $40,000; to manufacture screens, shutters and blinds, etc. Provisional directors, E. Watson, W. E. Smith and L. Watson, all of Toronto.

Blackwell Varnishes, Ltd., Toronto; capital, $50,000; to manufacture varnishes, paints and oils. Provisional directors, B. D. Blackwell, Margaret Blackwell and W. P. Hirst, all of Toronto.

Electric Distributing Co., Ltd., Toronto; capital, $100,000; to produce and accumulate electricity. Directors, A. G. Ross, M. L. Gordon, G. C. Loveys, W. Smith and W. S. Edwards.

Larder Lake Incline Mines, Ltd., Toronto; capital, $50,000; to engage in mining. Provisional directors, W. C. Macann, J. E. Riley, S. Wittmaak, G. B. Strathy and R. R. Perry, all of Toronto.

The Reid Foundry and Machine Co., Ltd., Ingersoll; to do a general iron and brass foundry business. Provisional directors, D. Reid and A. H. Marshall, Hamilton, and J. A. McCulloch, Ingersoll.

The Windsor Pearl Button Co., Windsor Ont.; capital, $40,000; to manufacture pearl buttons. The provisional directors include A. Moir, J. Moir, Burlington, Iowa, and J. L. Schram, New Boston, Ill.

Louis Trudel, Limited, Montreal; capital, $49,000; to manufacture dynamite, gunpowder, chemicals, compounds, etc. The charter members include L. Trudel, J. A. Chagnon and M. Larose, Montreal.

The Quebec Contracting Co., Quebec, Que; capital, $100,000: to carry on a general contracting and constructing business. The charter members include K. A. Morrison, W. Sharpe and A. H. Hall, Quebec.

The Allman Patent Pipe Co., Ltd., Toronto; capital, $125,000; to manufacture pipes and tobacconists' fancy goods. Provisional directors, Belle Doyle, R. D. Moorhead and R. H. Paterson, all of Toronto.

Starkey Mfg. Co., Ltd., Toronto; capital, $40,000; to manufacture and deal in brass, iron and steel specialties. Provisional directors, Ethel M. Wilson, Sarah A. Clyde and Ida M. Clyde, all of Toronto.

Northern Star Mining & Development Co., Ltd., Ottawa; capital, $100,000; to engage in mining. Provisional directors, A. E. Morris, L. O. McCormack, D. T. Douras and H. R. Meredith, all of Ottawa.

The Luxfer Prism Co., Toronto, have been incorporated with a capital of $30,000, to manufacture luxfer prism, glass, etc. The provisional directors include R. W. Eyre, E. E. Wallace and H. C. Macdonald, Toronto.

The Colonial Novelty Mfg. Co., Ltd., Montreal; capital, $5,000; to manufacture can-openers. Directors, H. J. Cassard, H. Stewart, C. C. Cottrell and Mary Graham, of Montreal, and C. Noreau, Quebec.

White & Manahan, Winnipeg, Man; capital, $100,000; to manufacture woolen, linen, silk and cotton goods, furs, leather, etc. The provisional directors include W. G. White, E. Manahan and C. H. Manahan, Winnipeg, Man.

The Holton Lumber Co., Belleville, Ont.: capital, $40,000; to manufacture lumber, timber, boxes, laths, doors, sashes, etc. The provisional directors include, G. H. Holton, C. J. Bowell, and M. Bowell, Belleville, Ont.

The Toronto and Niagara Carbide Co., Ltd., Toronto; capital, $100,000; to manufacture and refine the products of mines, etc. Provisional directors, Maggie McPhee, Amy B. Reston and Lydia W. Caton, all of Toronto.

The Ontario Marble Quarries, Ltd., Bancroft, Ont.; capital, $500,000; to operate stone quarries. Provisional directors, G. H. Sedgewick, A. T. Struthers, L. Davis, C. E. Stonehouse and J. W. Hefferman, all of Toronto.

The British-Canadian Asbestos Co., Ltd., Back Lake, Que.; capital, $1,000,000; to mine and manufacture asbestos. Directors, J. W. Cook, A. R. McMaster, A. W. G. Macalister, W. J. S. McMaster and Margaret T. Darragh.

The Spirella Co., of Canada, Ltd., Niagara Falls, Ont.; capital, $50,000; to manufacture wearing apparel. Provisional directors, W. W. Kincaid, J. H. Pardee, M. M. Beeman, J. H. Moore and E. E. Fowler, all of Meadville, Pa.

Quin Air-Brake Co., Ltd., Toronto; capital, $40,000; to carry on a general machine shop and foundry business. Provisional directors, R. C. Quin, W. H. Quin, T. A. Rowan, N. Sommerville and Edith Lackie, all of Swansea, Ont.

The Arbetter Felling Machine Co., Ltd., Montreal; capital, $150,000; to manufacture felling, sewing and machines of any description. Directors, J. Brault, B. Brault, L. T. Mongenais, H. E. Bourdon and J. B. A. Riendieu, all of Montreal.

Dr. Bellman Medical Co., Collingwood, Ont.; have been incorporated, with a capital of $100,000, to manufacture drugs, medicines, etc. The provisional directors include E. J. Bellman, G. P. Pearsall and J. M. O'Brien, Collingwood, Ont.

The Brandon Gas & Power Co., Brandon, Man.; capital, $1,00,000; to furnish gas and electricity and to manufacture gas and electric fixtures, etc. The provisional directors include A. C. Fraser, A. Mavbee and J. Hanbury, of Brandon, Man.

The Brandon Generator & Carbide Co., Brandon, Man.; capital, $50,000; to manufacture gasoline, gas, gas and electric fixtures, carbide, coke, oil, etc. The provisional directors include H. J. McNeil, G. Bewell and J. H. Ingram, Brandon, Man.

Scotland Box and Manufacturing Co., Limited, Township of Oakland, Ont.; capital, [illegible] 000; to manufacture wheelbarrows, etc. Provisional directors, J. E. Elliott, C. Mitchell, W. A. Stuart, M. N. Baldwin, A. McD. Robinson, W. E. Hooker and W. H. Biggar.

The Canadian H. W. Johns-Manville Co., Ltd., Toronto; capital, $50,000; to manufacture asbestos, roofing materials, pipe and boiler coverings, and railway supplies. Directors, G. W. Macdougall, K.C.; L. Macfarlane, C. A. Pope, A. Swindlehurst and McG. Barclay, all of Montreal.

Ajax Plastic, Ltd., Hamilton, Ont.; capital, $25,000; to manufacture and deal in lumber, stone and cement. Provisional directors, P. Bartholomew, Toronto; C. N. Clendening, Niagara Falls, Ont.; Norma Clendening, W. M. Clendening, Hamilton, and M. E. Hatt, Winnipeg.

The Canada Iron Corporation, Ltd., Montreal; capital, $8,000,000; to deal in and manufacture all kinds of clays, minerals and metallic substances and compounds. Directors, W. J. White, J. A. Cameron, H. J. J. McKeon, A. W. P. Buchanan and J. H. Dillon, all of Montreal.

The Sherbrooke Machinery Co., Ltd., Sherbrooke, Que; capital, $20,000; to manufacture paper and pulp-making machinery. Directors, W. J. Morey, Brookline, Mass; H. Parker, Nasbua, N.H.; Wm. C. Perkins, Vale Perkins, Que.; H. D. Lawrence and W. Morris, Sherbrooke.

The Dominion Tar & Ammonia Co., Ltd., Hamilton, Ont.; capital, $20,000; to manufacture drugs, paints and oils. Directors, Senator Wm. Gibson, Beamsville, Ont., and D. R. C. Martin, Robt. C. Fearman, J. M. Eastwood, Jno. Proctor, J. F. Leishman and Jno. Keillor Hamilton, Ont.

The Canadian H. W. Johns-Manville Co., Toronto, have been incorporated with a capital of $50,000 to manufacture asbestos, roofing materials, pipe and boiler coverings, cements, railway supplies, etc. The provisional directors include G. W. MacDougall, M. Barclay and A. Swindlehurst, Montreal.

New G.T.R. Shops for Montreal.

General Manager Hays, of the G.T.R., states that Montreal will have modern shops at an early date. The tracks will be straightened out and a new station worthy of the growing city will also be erected, but the financial conditions are not quite favorable enough just at present to warrant these undertakings being added to their many large works now under way.

Production of Gas From Peat.

The Dominion Government is considering the establishment of a plant in Ottawa for investigations into the production of producer gas

from peat. Mr. A. Amrep, Sweden, has been engaged by the Department of Mines to carry on the investigation.

Silliker Car Works, Halifax.

The new Silliker Car Co.'s plant, Halifax, for the manufacture of railway cars is finished and about 150 men are already at work in several of the departments. The company has several orders on hand and when business warrants it, will employ 500 men.

CATALOGUES WORTH HAVING.

DYNAMO BRUSHES—Pamphlet describing the Wirt type dynamo brushes for use on low-tension direct-current motors and generators. This brush has the very desirable quality of being flexible and at the same time making a good contact. Manufactured by the Cutler-Hammer Mfg. Co., New York.

PULLEYS—Pamphlet describing, with illustrations, the Philips pressed steel pulley, manufactured by Philips' Pressed Steel Pulley Works, Philadelphia. The chief feature of this pulley is the re-inforced centre ribs. Stock and price lists are given.

SEPARATORS—Bulletin Series D, No. 7, describing the individually motor driven extractors, separators and mixers for all kinds of work, manufactured by the D'Olier Engineering Co., Philadelphia.

BULLETIN SERIES C, NO. 4, issued by the D'Olier Engineering Co., Philadelphia, describing the irrigation plant installed by them for the Garden City Project. Illustrations of the electric power station and some of the centrifugal pumps are given.

SHAPERS—Pamphlet issued by Gould & Eberhardt, Newark, N.J., describing their "High Duty" shapers, with the new patent auxiliary cross-feed.

CIRCULAR—From Jones & Glassco, Montreal, giving a list of the British machinery handled by them, including power house and factory equipment.

GRINDING WHEELS—Catalogue and booklet describing the manufacture of alundum into grinding wheels, from the Canadian Fairbanks Co. Ltd., selling agents, for Norton grinding wheels and stones and carried in stock in their warehouses at Montreal, Toronto, St. John, Winnipeg, Calgary and Vancouver. Copies will be mailed to any address on application by mentioning Canadian Machinery.

GRINDING WHEELS—Complete catalogue of Canadian Hart Wheels, Hamilton, descriptive of their complete line of product. Contains much useful information, is well illustrated and contains price lists.

EMERY AND CORUNDUM WHEELS—Catalogue 20 of the Prescott Emery Wheel Co., Prescott, Ont., describing their corundum and emery wheels and polishers' supplies, containing price lists and instructions as to how to order grinding wheels.

BOOK REVIEWS.

STANDARD HANDBOOK FOR ELECTRICAL ENGINEERS—Written and compiled by a staff of specialists; published by the McGraw Pub. Co., New York. Price, $4.

This is the second edition of this work.

The book covers the entire field of electrical engineering, devoting to each topic an amount of space proportionate to its importance. The field is divided into 20 sections, these being arranged in the following general order: Fundamental theory, materials, apparatus, generation plants, transmission and distribution plants, utilization of electrical energy, standard practice and miscellaneous electrical information.

Each section of the book is intended to be a complete and self-contained treatise on the subjects covered by its title.

has been condensed as much as practicable, the thread of thought is carried logically throughout each section.

Special attention has been given to important subjects, such as materials used in Electrical Engineering, Design of Electrical Apparatus, Transmission Lines, Cost Data, Electric Traction, etc.

The index is most complete, covering 54 pages of the book, and the system of indexing contains several distinctive features which add to its efficiency.

The remarkable success of the first edition speaks well for the accuracy and value of this handbook.

BRENNAN'S HANDBOOK—A handbook of useful legal information for business men, by B. A. Brennan, contract manager of the Westinghouse Machine Co; published by the Electric Journal, 422-4 Sixth Avenue, Pittsburg, Pa. Price, $6.

This book is at present the only handbook on this subject in existence. The author has had over sixteen years' experience in actual contact with the different questions explained in this book while with the Allis-Chalmers Company, of Milwaukee, and their predecessors, the E. P. Allis Company, and more recently as contract manager of the Westinghouse Machine Company.

The book conprises a compact, systematic compendium of useful legal information for ready reference and gives a good understanding of the many principles of commercial law in a manner which can be easily understood by the average business man.

It explains contracts, sales, contract clauses, warranties, damages, liens, guarantees, notes, checks, bonds; it contains 140 legal forms of contracts, sales, notes, agreements, releases, etc. It contains a full synopsis of the statutes covering conditional sales, chattel mortgages, mechanic's liens, a tabulation of the collection laws and the statutory forms for acknowledgment for corporations and individuals.

It contains over 571 pages, is clearly indexed, neatly bound in flexible leather, gilt-edged pages and is suitable for library, desk or traveling purposes.

PROFIT-MAKING IN SHOP AND FACTORY MANAGEMENT—By Chas. U. Carpenter; published by the Engineering Magazine, New York.

The contents of this book appeared in the form of a series of articles published in the Engineering Magazine. As the matter appears now it is a concise expression of the methods which Mr. Carpenter has developed and which he constantly uses in his own practice. They have been tried and perfected under the stress of daily operation in the course of his experience as supervisor, manager, head of labor department and president of various large manufacturing plants.

The book is a valuable addition to the literature of the industrial engineer.

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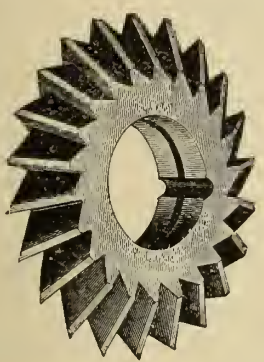

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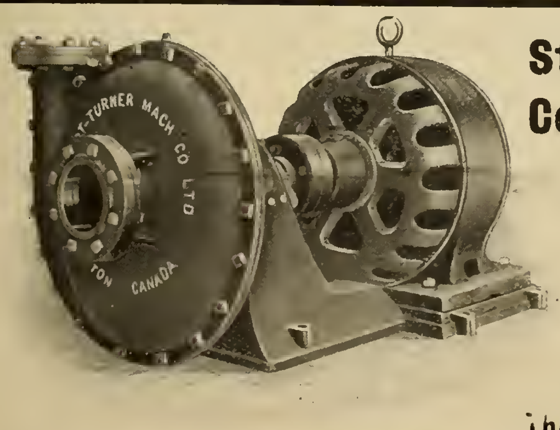

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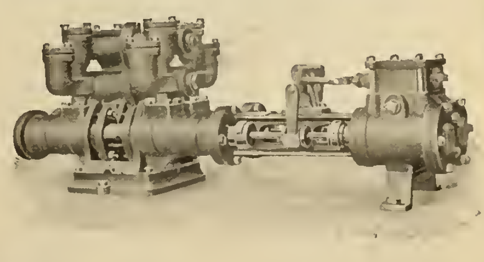

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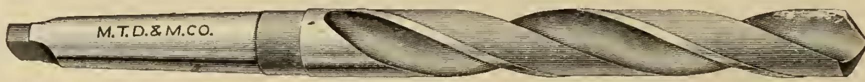

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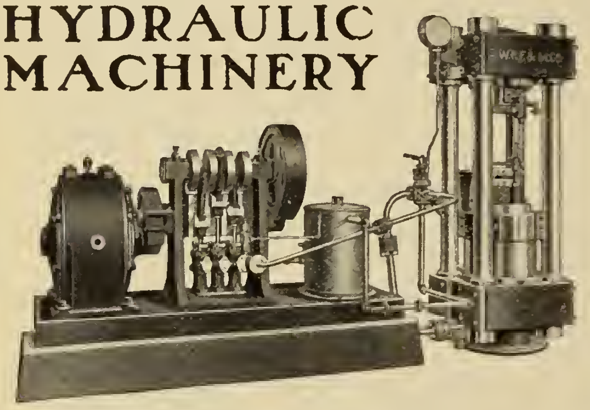

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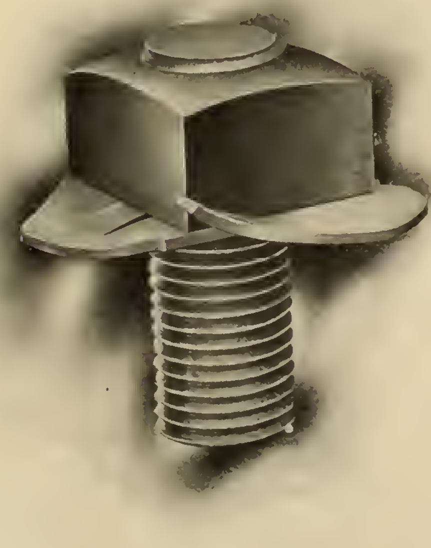

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Stevens Co., Galt, Ont
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Lumen Bearing Co., Toronto

Castings, Semi-Steel.
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Gas & Electric Power Co., Toronto
John McDougall Caledonian Iron Works Co., Montreal.
Pratt & Whitney Co., Harlford, Conn.

Centrifugal Pumps—Turbine Driven
Kerr Turbine Co., Wellsville, N.Y.

Charcoal.
Detroit Foundry Supply Co., Windsor.
Doggett, Stanley, New York
Dominion Foundry Supply Co., Toronto
Hamilton Facing Mill Co., Hamilton.
Hyde, Francis & Co. Montreal
Smith, J. D., Foundry Supply Co., Cleveland, Ohio

Charcoal Facings.
Doggett, Stanley New York

Chemicals.
Canada Chemical Co., London.

Chrome Brick.
Harbison - Walker Refractories Co., Pittsburg

Chucks, Drill and Lathe.
American Tool Works Co., Cincinnati.
John Bertram & Sons Co., Dundas, Ont.
Canada Machinery Agency, Montreal.
Cleveland Twist Drill Co., Cleveland
Hamilton Tool Co., Hamilton, Ont.
Jacobs Mfg. Co. Hartford, Conn
Ker & Goodwin, Brantford.
London Mach. Tool Co., Hamilton.
National Twist Drill & Tool Co., Detroit
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.
Rice Lewis & Son, Toronto.
Standard Tool Co., Cleveland.

Chucks (Planer or Milling.)
Holland's Mfg. Co., Erie, Pa.

Chucking Machines.
American Tool Works Co., Cincinnati.
Lewis, Rice, & Son, Toronto
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.
Warner & Swasey Co., Cleveland, Ohio

Circuit Breakers.
Allis-Chalmers-Bullock, Limited, Montreal
Canadian General Electric Co., Toronto.
Canadian Westinghouse Co., Hamilton.
Gas & Electric Power Co., Toronto.

Cloth and Wool Dryers.
B. Greening Wire Co., Hamilton.
Sheldons Limited, Galt

Coal Boring Machines.
Cumming, J. W., New Glasgow, N.S.

Coal Handling Machinery.
Jeffrey Mfg. Co., Columbus, Ohio

Coal Miners' Tools.
Cumming J. W., New Glasgow, N.S.

Collectors, Pneumatic.
Sheldons Limited, Galt

Compressors, Air.
Allis-Chalmers-Bullock, Limited, Montreal
Canada Foundry Co., Limited, Toronto.
Canada Machinery Agency, Montreal.
Canadian Rand Co., Montreal.
Canadian Westinghouse Co., Hamilton.
Darling Bros., Ltd., Montreal
Gas & Electric Power Co., Toronto.
John McDougall, Caledonian Iron Works Co. Montreal
The Smart-Turner Mach. Co., Hamilton.
Hall Engineering Works, Montreal, Que.
Niles-Bement-Pond Co., New York,
H. W. Petrie, Toronto.
Williams & Wilson, Montreal.

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Allis-Chalmers-Bullock, Montreal.

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Jeffrey Mfg. Co., Columbus, Ohio.

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Canada Machinery Agency, Montreal.
Goldie & McCulloch Co., Galt.
Hall Engineering Works, Montreal.
Smart-Turner Machine Co., Hamilton.
Waterous Engine Co., Brantford.

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Connor, A. W., Toronto
Fensom, C. J., Toronto
Hall Engineering Works, Montreal.
Jules De Clercy, Montreal.
Roderick J. Parke, Toronto.
T. Pringle & Son, Montreal.
Somerville, T. A., Hamilton
Stewart & McTaggart, Hamilton
Taylor, James, Wine Harbor, N.S.

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John McDougall, Caledonian Iron Works Co., Montreal.
Niagara Falls Machine & Foundry Co., Niagara Falls, Ont.

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Allis-Chalmers-Bullock, Montreal.
Canadian General Electric Co., Toronto.
Canadian Westinghouse Co., Hamilton.
Gas & Electric Power Co, Toronto
T. & H. Electric Co., Hamilton.

Conveyor Machinery.
Goldie & McCulloch Co., Galt
Jeffrey Mfg. Co., Columbus, Ohio.
Laurie Engine & Machine Co., Montreal.
Rice Lewis & Son, Toronto
John McDougall Caledonian Iron Works Co., Montreal.
Smart-Turner Machine Co., Hamilton.
Waterous Engine Works Co., Brantford.
Williams & Wilson, Montreal.
Wilson, J. C. & Co., Glenora, Ont

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Niles-Bement-Pond Co., New York.

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Canadian Hart Wheels Ltd., Hamilton

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Falls Rivet & Machine Co., Cuyahoga Falls, Ohio.

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Detroit Foundry Supply Co., Windsor.
Dominion Foundry Supply Co, Toronto
Hamilton Facing Mill Co., Hamilton.
Hyde, Francis & Co., Montreal
Smith, J. D., Foundry Supply Co, Cleveland, Ohio.

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Smith, J. D, Foundry Supply Co., Cleveland, Ohio

Core Ovens.
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Dominion Foundry Supply Co., Montreal
Falls Rivet & Machine Co, Cuyahoga Falls, Ohio.
Hamilton Facing Mill Co., Hamilton.
Hyde, Francis & Co., Montreal
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Whiting Foundry Equipment Co., Harvey, Ill.

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Falls Rivet & Machine Co., Cuyahoga Falls, Ohio.

Core Sand Cleaners.
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Wilson, J. C., & Co. Glenora Ont.

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Canadian Rand Co., Montreal.
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Canada Foundry Co., Limited Toronto
Canadian Pilling Co, Montreal
Canadian Rand Co., Montreal.
Cleveland Crane & Car Co., Wickliffe, Ohio.
Dominion Foundry Supply Co., Montreal
Gas & Electric Power Co Toronto
Hamilton Facing Mill Co, Hamilton
John McDougall, Caledonian Iron Works Co., Montreal.
Niles-Bement-Pond Co., New York.
Northern Engineering Works, Detroit
Owen Sound Iron Works Co, Owen Sound
Smart-Turner-Machine Co., Hamilton.
Smith, J. D., Foundry Supply Co, Cleveland, Ohio.
Whiting Foundry Equipment Co., Harvey, Ill

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Sight Feed Oil Pump Co., Milwaukee, Wis.

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London Mach. Tool Co., Hamilton.
Niles-Bement-Pond Co., New York.

Cross Head Pins.
Sight Feed Oil Pump Co., Milwaukee, Wis.

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Dominion Foundry Supply Co., Montreal
Goldschmidt Thermit Co. Toronto
Hamilton Facing Mill Co., Hamilton.
Hyde Francis & Co., Montreal
Stedel R. B., Inc. Philadelphia
Smith, J D, Foundry Supply Co., Cleveland, Ohio.

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Allis-Chalmers-Bullock, Montreal.
Jeffrey Mfg. Co., Columbus, Ohio.

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Dominion Foundry Supply Co., Montreal
De Clercy, J., Montreal
Hamilton Facing Mill Co., Hamilton.
Hyde, Francis & Co., Montreal
Northern Engineering Works, Detroit
Sheldons Limited, Galt.
Smith, J. D., Foundry Supply Co., Cleveland, Ohio.
Whiting Foundry Equipment Co. Harvey, Ill.

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Cupola Blocks.
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Northern Engineering Works Detroit
Ontario Lime Association Toronto

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Dominion Foundry Supply Co, Toronto
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Cutter Grinders.
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London Mach. Tool Co., Hamilton.
H. W. Petrie, Toronto.
Pratt & Whitney Co., Hartford, Conn.

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London Mach. Tool Co., Hamilton.
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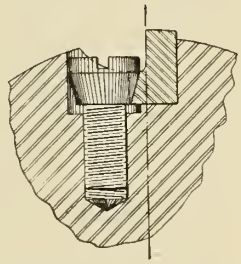

Catalog No. 33?

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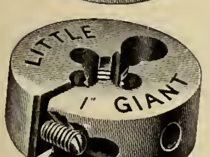

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Ontario Lime Association Toronto
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Hyde, Francis & Co , Montreal
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Williams & Wilson, Montreal

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Pratt & Whitney Co., Hartford, Conn.

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Becker - Brainard Milling Mach. Co. Hyde Park, Mass.
Bickford Drill & Tool Co., Cincinnati.
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Lewis, Rice & Son, Toronto.
London Mach. Tool Co., Hamilton.
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.
Pratt & Whitney Co., Hartford. Conn.
Stevens Co , Galt, Ont .
Williams & Wilson, Montreal.
Wilson, J. C., & Co , Glenora, Ont.

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Wilson, J. C., & Co., Glenora, Ont.

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Wilson, J. C., & Co., Glenora, Ont.

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Wilson, J. C., & Co., Glenora, Ont.

Gears, Rawhide.

Goldie & McCulloch Co., Galt, Ont.
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Gears, Worm.

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Horsburgh & Scott Co., Cleveland
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Canadian Westinghouse Co., Hamilton.
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Wilson, J. C., & Co., Glenora, Ont.

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Doggett, Stanley, New York
Dominion Foundry Supply Co., Toronto
Hamilton Facing Mill Co., Hamilton.

Grinders, Automatic Knife.

Canadian Hart Wheels Ltd., Hamilton.
W. H. Banfield & Son, Toronto.

Grinders, Bench.

Canadian Hart Wheels Ltd., Hamilton.
McKenzie, D., Guelph, Ont.
Hall, J. H., & Sons, Brantford.
Lewis, Rice & Son, Toronto

Grinders, Centre.

Canadian Hart Wheels Ltd., Hamilton.
Lewis, Rice & Son, Toronto.
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.

Grinders, Cutter.

Becker-Brainard Milling Mach. Co., Hyde Park, Mass.
Gould & Eberhardt, Newark, N.J.
Lewis, Rice & Son, Toronto.
Pratt & Whitney Co., Hartford, Conn.

Grinders, Disc.

Armstrong Bros. Co , Chicago

Grinders, Tool.

Armstrong Bros. Tool Co., Chicago.
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Gisholt Machine Co Madison, Wis.
Lewis, Rice & Son, Toronto.
H. W. Petrie, Toronto.
Williams & Wilson, Montreal.

Grinders, Pedestal.

Canadian Hart Wheels Ltd. Hamilton
Hall, J. H., & Sons, Brantford.

Grinding Holders.

Armstrong Bros. Tool Co., Chicago

Grinding Machines.

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Independent Pneumatic Tool Co., Chicago, Ill.
Niles-Bement-Pond Co., New York.
H. W. Petrie. Toronto.

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Norton Company Worcester, Mass.

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Frothingham & Workman, Ltd , Montreal
Lewis, Rice & Son, Toronto.
McKenzie D , Guelph, Ont.
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Simonds Canada Saw Co,, Montreal
Williams & Wilson. Montreal.

Hack Saw Frames.

Simonds Canada Saw Co., Montreal.

Hammers, Belt Driven.

Beaudry & Co., Inc., Boston

Hammers, Drop.

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Ferracute Machine Co , Bridgeton, N.J.
London Mach. Tool Co., Hamilton, Ont.
Niles-Bement-Pond Co., New York.

Hammers, Hand.

Whitman & Barnes Mfg. Co., St. Catharines, Ont.

Hammers, Steam.

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John Bertram & Sons Co. Dundas, Ont.
London Mach. Tool Co., Hamilton, Ont.
Niles-Bement-Pond Co., New York.

Hammers, Trip.

Beaudry & Co., Inc., Boston

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Waterous Engine Co., Brantford.
Wilson, J. C., & Co., Glenora, Ont.

Hoists, Electric.

Northern Engineering Works, Detroit
Whiting Foundry Equipment Co., Harvey, Ill.

Hoists, Pneumatic.

Canadian Rand Co., Montreal.
Dominion Foundry Supply Co., Montreal
Hamilton Facing Mill Co., Hamilton.
Northern Engineering Works, Detroit
Whiting Foundry Equipment Co. Harvey, Ill.

Hoists, Portable & Stationary.

Canadian Piling Co., Montreal

Hose, Air.

Canadian Rand Co., Montreal.
Canadian Westinghouse Co., Hamilton.
Independent Pneumatic Tool Co.,Chicago

Hose, Steam.

Allis-Chalmers-Bullock, Montreal.
Canadian Rand Co., Montreal.
Canadian Westinghouse Co., Hamilton.
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Niles-Bement-Pond Co , New York.
The Smart-Turner Mach. Co., Hamilton.

Hydraulic Machinery.

Allis-Chalmers-Bullock,Montreal
Gas & Electric Power Co.. Toronto.
Wilson J. C., & Co., Glenora, Ont.

Index Centers.

Stockbridge Machine Co., Worcester, Mass.

India Oil Stones.

Norton Company, Worcester, Mass.

Indicators, Speed.

L. S. Starrett Co., Athol, Mass.

Injectors.

Canada Foundry Co., Toronto.
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Rice Lewis & Son, Toronto.

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Detroit Foundry Supply Co., Windsor.
Dominion Foundry Supply Co. Toronto
Hamilton Facing Mill Co., Hamilton
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Norton, A. O., Coaticook, Que.

Jigs.

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Scott, Ernest, Montreal.

Knives, Planer, Paper and Woodworking.

Whitman & Barnes Mfg. Co., St. Catharines, Ont.

Ladles, Foundry.

Dominion Foundry Supply Co.. Montreal
Hyde Francis & Co., Montreal
Northern Engineering Works. Detroit
Smith, J. D., Foundry Supply Co., Cleveland, Ohio.
Whiting Foundry Equipment Co., Harvey, Ill.

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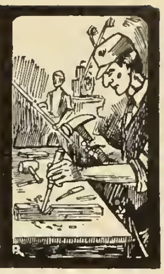

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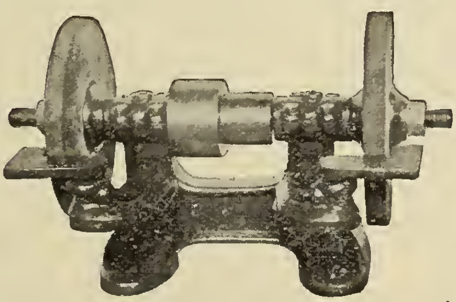

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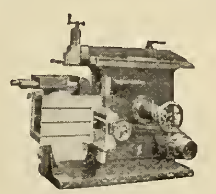

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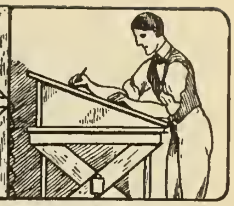

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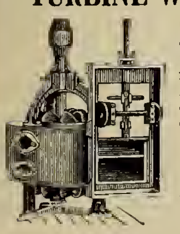

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Canadian Pilling Co., Montreal

Window Wire Guards.

Expanded Metal and Fireproofing Co. Toronto.
B. Greening Wire Co., Hamilton, Ont

Wire, Americanite, Magnet, Anunciator.

Eugene F. Phillips Electrical Works, Montreal

Wire, Bare and Insulated.

Eugene F. Phillips Electrical Works, Montreal.

Wire Chains.

The B. Greening Wire Co., Hamilton.

Wire, Magnet and Trolley.

Eugene F. Phillips Electrical Works, Montreal.

Wire, Railway Feeder and Trolley.

Eugene F. Phillips Electrical Works, Montreal.

Wire Cloth and Perforated Metals.

Expanded Metal and Fireproofing Co. Toronto.
B. Greening Wire Co., Hamilton. Ont.
Johnson, C H., & Sons, St. Henri, Montreal.

Wire Guards and Railings.

Expanded Metal and Fireproofing Co. Toronto.
B. Greening Wire Co. Hamilton, Ont.

Wire Nail Machinery.

National Machinery Co., Tiffin, Ohio.

Wire Rope.

Bullivant & Co., London, Eng.
B. Greening Wire Co.. Hamilton, Ont.

Wood Boring Machines. Pneumatic.

Independent Pneumatic Tool Co., Chicago, Ill.

Wood-working Machinery.

Canada Machinery Agency, Montreal.
The Canadian Fairbanks Co., Montreal.
Fay, J. A., & Egan Co., Cincinnati
Goldie & McCulloch Co., Galt.
H. W. Petrie, Toronto.
Waterous Engine Works Co., Brantford
Williams & Wilson, Montreal.

Wrenches.

Whitman & Barnes Mfg Co, St. Catharines, Ont.

ALPHABETICAL INDEX

MANUFACTURERS AND MANUFACTURERS' AGENTS.

It will pay you to watch our condensed column each month. There are many money-making propositions brought to your attention here. You may find just what you are looking for.

RATES

One insertion—25c. for 20 words; 1c. a word for each additional word.

Yearly rate—$2.50 for twenty words or less, 10c. a word for each additional word.

The above does not apply to notices under the head of "Machinery Wanted." These notices are inserted free for subscribers.

AGENTS WANTED.

BRASS AND COPPER TUBES, SHEETS, STRIPS, etc., English manufacturers knowing Canadian market, require smart, pushing agent, who understands the trade, for Quebec and Maritime Provinces. Apply, in confidence, with full particulars, to Box 99, CANADIAN MACHINERY, 88 Fleet St., E. C., London, England. (7)

BELTING, PACKING, ETC.

BELTING, RUBBER, CANVAS AND LEATHER, Hose Packing, Blacksmith's and Mill Supplies at lowest price. N. Smith, 138 York Street, Toronto. (2tf)

MACHINERY FOR SALE.

FOR SALE—A large double geared shear, a large powerful press fitted with appliances for punching iron, two fans and other machines. Nat'onal Tool and Axe Works, Three Rivers, Que. [6]

FOR SALE—One Canadian general generator, 2 phase, 75 kilowatt, complete with exciter. Has never been in use. Full information on request. Gunns Limited, West Toronto, Ont. [6]

GASOLENE ENGINE CASTINGS.

MARINE gasolene engine castings, with blue print and full instructions, etc.; 2½, 4, 6 h.p.; also complete finished outfits at $65 up; catalogue, Krug & Crosby, Hamilton. [10tf]

MACHINERY WANTED.

WANTED—Second-hand Iron Planer, about 24 in. x 24 in. x 6 ft. Must be in fair order and a bargain for cash. Address, Harry M. Wolfenden, Box 305, Barrie, Ont. (6)

SITUATION WANTED.

SITUATION WANTED—By foreman moulder with large experience on gas and gasolene engine castings. Would like a position with firm not satisfied with cost of castings. Box 62, CANADIAN MACHINERY, Toronto. (6)

RUBBER STAMPS, ETC.

B. CAIRNS, MANUFACTURER OF RUBBER stamps, stencils, steel stamps, burning brands. 77-79 Queen Street East, Toronto, Ont.

PARTNER WANTED.

ESTABLISH your own factory and mail order business. I want a partner in Canada. Factory equipped for less than $200. Cement brick machine. Cheapest in the world. Simple and rapid. Have metal parts made in city near Canada. Canadian patent Jan. 7, 1908. Most liberal terms. D. F. McDonald, Lake Butler, Fla., U.S.A. [7]

FOUNDRY EQUIPMENT.

WANTED—To purchase or work on royalty, articles relating to modern foundry equipment, which will guarantee economy and a saving of labor over present methods. Forward blue prints or patterns. Address Box 63, CANADIAN MACHINERY, Toronto.

METALLIC PACKING.

MANUFACTURE METALLIC PACKING—On receipt of two dollars we will send printed illustrated formula for making Plastic Metallic Packing for steam, water, air, gas, hydraulic machines, valves, etc. Address, Ideal Metallic Packing Co., South Stillwater, Minn. [12]

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FACTORY BUILDINGS FOR SALE.—Having moved into our new factory we will dispose of the one formerly occupied, consisting of foundry, machine and carpenter shops, with engine, boiler and line shafting, blacksmith shop, boiler shop, pattern and other storehouses. This is a splendid opportunity for parties wishing to locate in a town with exceptional advantages. Welland has cheap electric power from two companies, natural gas, water works, sewers, five railways and one electric railway, water transportation via the Welland Canal. M. Beatty & Sons, Limited, Welland, Ont. [6]

REPRESENTATION.

GENTLEMAN presently in Canada desires to represent, in Great Britain, manufacturers. Specials, Engineers' Supplies, Furnishings, etc. Address Box 61, CANADIAN MACHINERY, Toronto. (7)

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THE BUSY MAN'S MAGAZINE is the most popular periodical of its kind. Why? Because each issue contains a strong list of original articles of interest to every Canadian. It also reproduces the most timely, instructive and interesting articles appearing in the other magazines and periodicals of the month. The cream of the world's periodical press is too valuable to overlook. BUSY MAN'S is on sale at all news-stands. Better still, send $2 for one year's subscription. Mail it to day. The Busy Man's Magazine, Toronto.

THE MARKET REPORTS make Hardware and Metal a necessity to every hardware merchant, paint and oil dealer, foundry, or other metal manufacturing plant, in Canada. It is mailed every Friday. Subscription price $2.00 per year. Address Hardware and Metal, Montreal Toronto or Winnipeg,

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NATIONAL AID—An aid to every business man in the world. Saves money, time, work and worry. The National Cash Register Co., F. E. Mutton, Canadian Manager, 129 West King Street, Toronto, Ont.

HIGH CLASS COLOR WORK.—Commercial stationery, posters. The Hough Lithographing Co.. Limited. Office, No. 3 Jarvis Street, Toronto, Telephone, Main 1576. Art, good workmanship business methods. [tf]

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WANTED in every town of 2000 or over, a representative to take charge of the circulation of our various publications: — Hardware and Metal, Canadian Grocer, Financial Post, Plumber and Steamfitter, Dry Goods Review, Printer and Publisher, Bookseller and Stationer, Canadian Machinery, and Busy Man's Magazine. Good financial standing and business connection a strong recommendation. A permanent position for the right man. The MacLean Publishing Company, Limited, Toronto.

FOR SALE.

SECOND HAND BOILERS FOR SALE.—On account of now using electric power exclusively in our plant in place of steam, we wish to dispose of our two boilers, as follows: One Return Boiler, 18 ft. long, 6 ft. diameter, 72 x 4 in. flues. One Direct Boiler, 14½ ft. long, 9 ft. diameter, 146 x 4 in. flues. These boilers are in first-class condition. Address, Pratt & Letchworth Co., Brantford, Canada. (9)

FOR SALE

1,500 ft. 8 in. New Rubber Belting
2,500 ft. 2 in. New Leather Belting
50,000 ft. Pipes and Boiler Tubes, all sizes.
50 pieces Steel Beams
5,000 pieces 1-2 and 3-4 in. Second-hand Wire Cable. Cheap. Write

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ELLIOTT-FISHER, Ltd., 129 Bay St., TORONTO

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Manufacturers of Pneumatic Drills, Hammers, Rivetters, Grinders, Etc.

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built by

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Pulleys, Shafting and Shaft Fittings, Air Compressors, Sand Blast Apparatus.

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for Gas, Steam, Water, Hydraulic, and Refrigerating, and other purposes.

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Makers of all kinds of High Speed Tools for Engineers, Shipbuilders, Electricians, Etc.

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Send for our new and latest catalogue of INJECTORS, EJECTORS, and all kinds of STEAM JET APPLIANCES.

Simplest, Cheapest and Best.

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are let to British Manufacturers and Exporters at £3. 3s. 0d. per year, or a special rate of £10. 10s. 0d. for five years.

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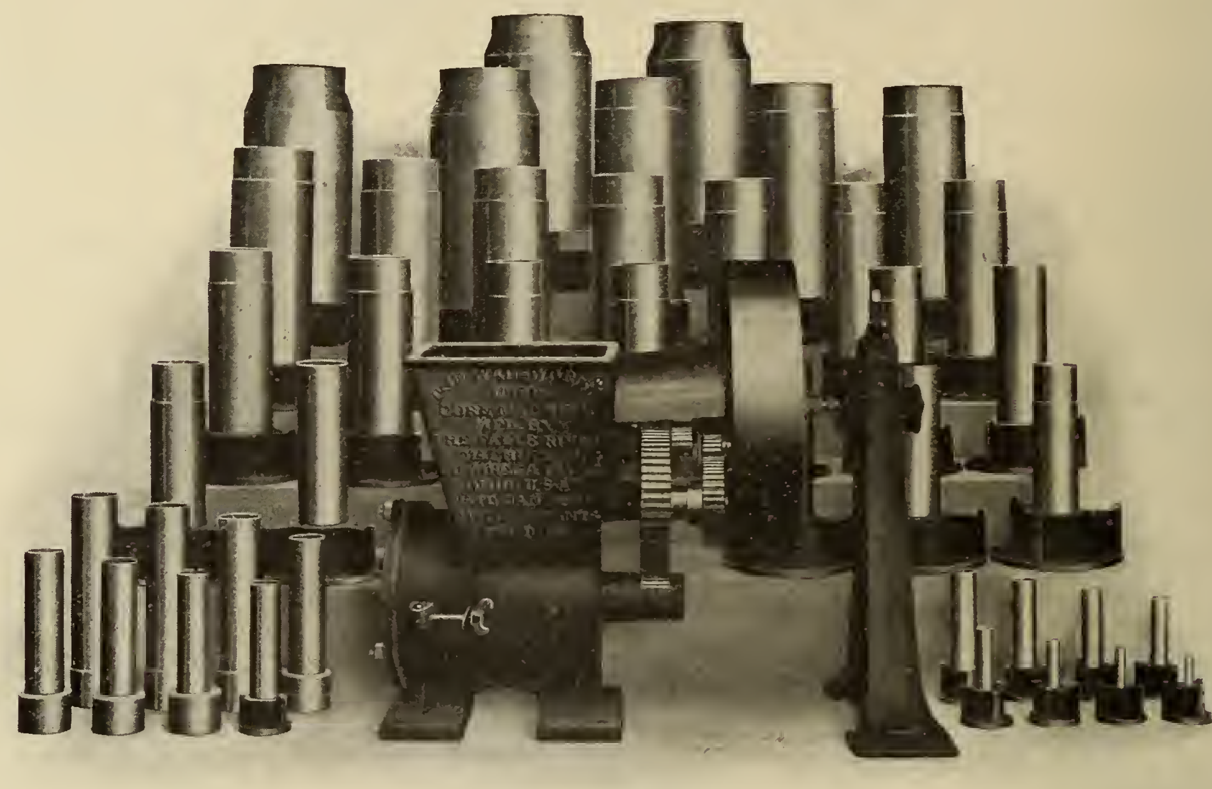
CANADIAN MACHINERY & MANUFACTURING NEWS

88 Fleet Street, - LONDON

THE WADSWORTH
IMPROVED CORE MACHINES

The only Core Machine manufacturers in the world manufacturing a complete line of Core Making Machinery—5 separate and distinct Core Making Machines, Portable Core Ovens to bake the cores in after making. Core Cutting Off and Coning Machines and manufacturers of a Standard Core Print.



The only Core Machine manufactured that can make a Rodded Core. Any size rod can be used. Hand or Power driven, makes round Cores from ⅜ in. to 7 in. Also irregular shapes. 40 sizes of Cores, all made on one machine.

We are Core Machine Specialists

Compare your time with that of THE WADSWORTH Machine.

One 6″ Core, 24″ long, by hand power in 12 seconds.
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The great strength and accuracy of cores, together with the wide range of shapes possible, make them a valuable foundry investment.

Write for prices and descriptive catalogue.

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Cuyahoga Falls, Ohio, U.S.A.

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THE HAMILTON FACING MILL CO., Ltd., Hamilton Ont., and Montreal, Que.

"MADE IN CANADA"

THE

"Reid" Molding Machine

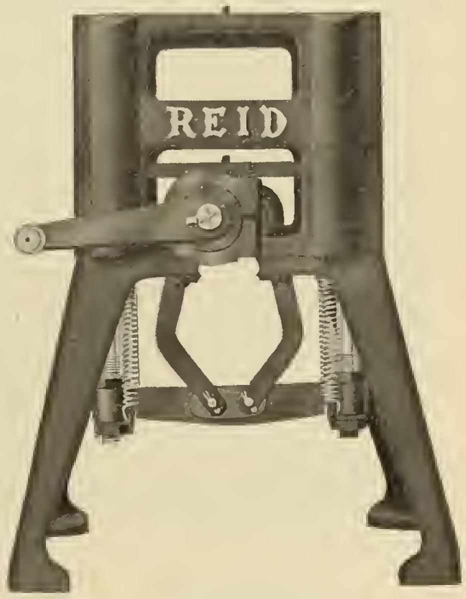
Hand-Rammed, Stripping Plate

¶ The "Reid" Molding Machine is acknowledged by foundry foremen generally to be the best in the market.

¶ The superintendent of one of the largest foundries in the United States, who has used all styles of molding machines, has this to say of the "Reid"—

> "They are the cheapest, most rigid, and **most perfect** draw-down machine I ever saw."

¶ One Canadian firm has 42 in their grey iron and brass foundries, and are well satisfied.



12-in. Machine
Front view, showing pattern frame down

Points to Compare With Others

The "Reid"—Light, but Rigid, and Perfect in action.

Double Cranks and Shafts connected with cut steel gears, giving absolute perpendicular motion, without lateral wear on stripping plate or pattern.

Open Ends and Front Lever, allowing any reasonable extension of patterns over the length of frame.

Four Half-Round **adjustable** Bearings situated at corners of machine where they are handy to get at and fully protected from sand.

On the Standard sizes we give you from two to five inches more draw than any other maker without extra charge.

¶ A number of these machines are used in jobbing foundries, without a stripping plate.

¶ Send us a sketch or a sample casting that you would like to make on a machine, and we will gladly tell you what we can do for you.

12-in. Machine Side view

Write for Circular

Sole Canadian Manufacturers:

The Reid Foundry and Machine Co.

Ingersoll - Ontario

☞ We have a well equipped foundry and are prepared to turn out light or heavy castings in **Grey Iron, Semi-Steel** or **Brass.** Let us quote you prices on your work. Satisfaction guaranteed.

F. B. Stevens.

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NO USE IN TRYING!

STEVENS' GENUINE EAST INDIA PLUMBAGO cannot be "knocked out" any more than you can knock out the blue sky. It is a product of nature, found somewhere down by Ceylon's coral strand.

It's the only lead you ought to use, or any Foundryman ought to use.

It is good merely because it is pure and unadulterated, and every barrel is just alike. It's a time saver and money saver. Just now "money-savers" ought to interest you.

I manufacture **Foundry Facings, Foundry Supplies, Buffing Compositions and Platers' Supplies.**

I maintain a warehouse in Windsor and all Canadian shipments are free from Custom House details.

Write me a letter. I would rather read letters than smoke cigars, and I am something of a smoker, too.

FREDERIC B. STEVENS, - DETROIT, MICH.

OFFICE: LARNED and THIRD STS. FACING MILL: ISABELLA AVE. and M. C. R. R.

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TRADE MARK—REG. U. S. PAT. OFF.

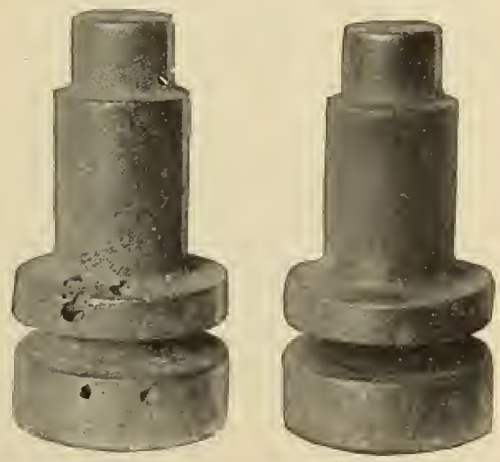
Pump Repaired with Smooth-on Iron Cement No. 1 six years ago, and still in use.

Write for circular showing how work was done.

SMOOTH-ON IRON CEMENT No. 1

is prepared in powdered form—for use mix with water. It is unequaled for stopping leaks of Steam, Water, Fire or Oil, because it becomes metallic iron that has the same expansion and contraction as iron, thus keeping tight at all temperatures. Engineers and Foundrymen use it where a smooth surface and metal-like hardness are desired.

Sold in Blue Label Cans.



Before Using Smooth-On Castings. After Using Smooth-On Castings.

Cheapest and Best Cement on the Market for Foundry Use.

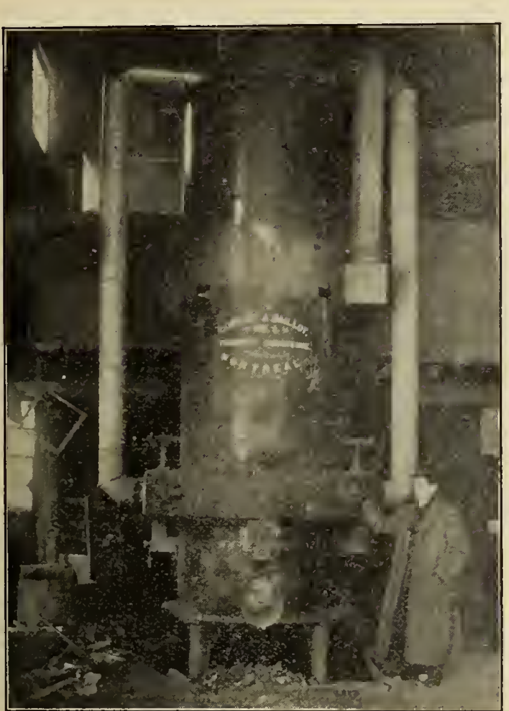
Sold in Yellow Label Cans.

SEND FOR ILLUSTRATED CATALOG AND PRICES OF THE DIFFERENT SMOOTH-ON CEMENTS.

SMOOTH-ON MANUFACTURING CO., JERSEY CITY, N. J. U.S.A.

FOR SALE BY SUPPLY HOUSES.

A Great Success!



Baillot Cupola installed in foundry of Mr. Rheaume, Montreal.

The Baillot Cupola Exhibition at Toronto in June was a great success.

Baillot Cupolas are specially designed to suit each case.

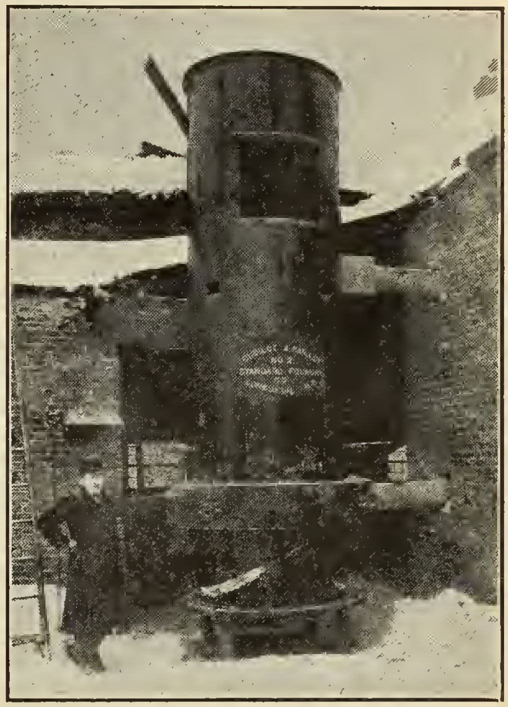
Guaranteed saving of 15 per cent. to 30 per cent. in fuel.

Better quality castings.

Hotter iron.

See our cupolas in operation in Montreal.

Can be erected in any part of the city — No sparks — No flames.



Baillot Cupola installed in Standard Foundry & Machine Co., Longueil, P.Q.

The BAILLOT CUPOLA COMPANY

of PARIS, FRANCE

Capital paid up, 1,500,000 Francs

JULES DE CLERCY, C.E. Sole General Agent for Canada and United States

No payment required except a part of the tested economy.

Old cupolas adapted to Baillot system or built new on same terms.

We build or alter cupolas at our own expense and guarantee results.

Baillot cupolas for malleable iron.

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Sole Agent for Canada and the United States

62 Ontario Street West, MONTREAL, Canada

YOU CAN SAVE MONEY BY MAKING A CONTRACT

Tap Screws
Square Head
Hex Head
Filister Lead
Finished
Case Hardened

Cold Pressed Nuts
Square
Hexagon
Blank
Semi Finished
Finished

CANADA FOUNDRY COMPANY, Limited

Head Office and Works: TORONTO, ONT.

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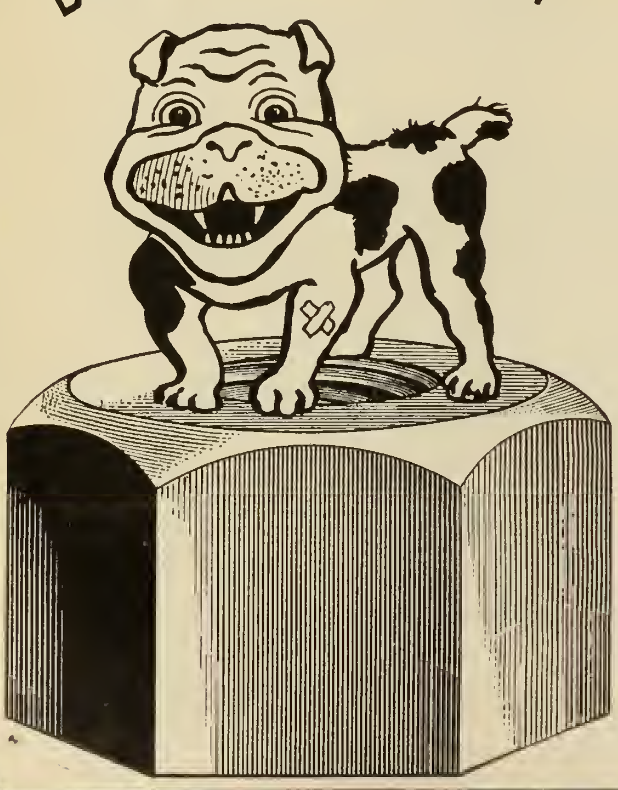
DOG-ON-GOOD-NUT



WHO WOULD PURCHASE

A
Cold Punched
Nut, when a High-Grade
Turned Steel Product
can be procured at
the same price

WOULD YOU?

Send for catalogue, price list and samples, convincing yourselves

CANADA NUT CO.

NIAGARA FALLS, - ONT.

HIGH SPEED TWIST DRILLS

The marvellous results obtained from the use of our Drills are facts, not theories.

Write us for Catalogue and Discount Sheets.

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WELL KNOWN BRANDS MADE IN CANADA BY

Nicholson Co.

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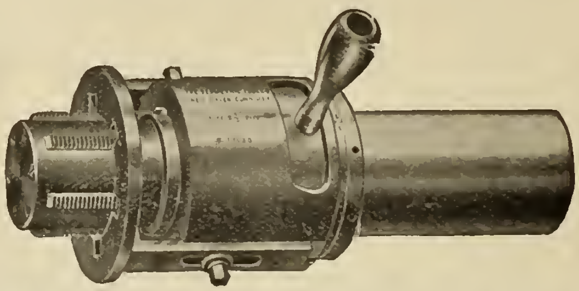

The GEOMETRIC COLLAPSING TAPS

are what you need to keep down costs and increase your profits in tapping duplicate threads.

They contain all the features necessary for profitable manufacturing, convenience of operation and first-class materials.

We make these tools in standard pipe sizes from ¾" to 16" inclusive, and also furnish them for straight tapping of corresponding diameters. Can be used on drill press, screw machine turret or engine lathe carriage.

Send us samples of the tapping you wish to accomplish and we will be glad to quote you price on a suitable equipment of tools to take care of same.

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Canadian Agents, Williams & Wilson, Montreal, Que.

Would You Take the Money?

If we should hand you a sum of money equal to 20% of your Twist Drill account, would you take it? Most likely you would.

While you may not see any "real money," if you will use

"Norka" High Speed Twist Drills

you can save a big slice from the cash you are paying now for drilling.

BECAUSE

"Norka" High Speed Twist Drills are the strongest High Speed Twist Drills made, as they are twisted while hot and the grain of the steel is not disturbed, therefore your breakage will be practically eliminated.

"Norka" High Speed Twist Drills are capable of standing as high rate of speed as any High Speed Twist Drill, and will take a much heavier feed, hence the capacity of your drill presses is increased and your actual cost for drilling is reduced.

On **"Norka" High Speed Twist Drills** a piece of the stock from which they are twisted is left flat to fit into the chuck, hence no broken or twisted tangs or shanks and no drills going to the scrap pile for this reason.

If you want to save the money why not make a test? That's all we ask.

Catalogue No. 67 sent on application.

W & B CO TRADE MARKS W&B

The WHITMAN & BARNES MFG. CO.

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ST. CATHARINES, ONT.

THE STANDARD TOOL CO'S

STANDARD TOOL CO.

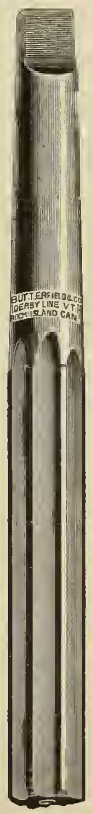
Drill Chucks

Are you looking for a Strong, Durable Chuck that will give you satisfactory service? One that is reasonable in price and has given economical results under all conditions? Then buy " The Standard Improved." It is the best "Chuck Value" obtainable.

VERY STRONG AND SUBSTANTIAL

OFFICE and FACTORY
Cleveland, Ohio

EASTERN SALESROOM
94 Reade St., New York



Everything has a Standard

by which all things of a similar nature are judged. Most good mechanics are agreed that

BUTTERFIELD
is the standard

when it comes to

Taps, Dies and Reamers

They are the most accurately made taps, dies and reamers on the market, and the material from which they are made is the highest grade obtainable.

Ask Us for Quotations!

Butterfield & Co., Rock Island Que.

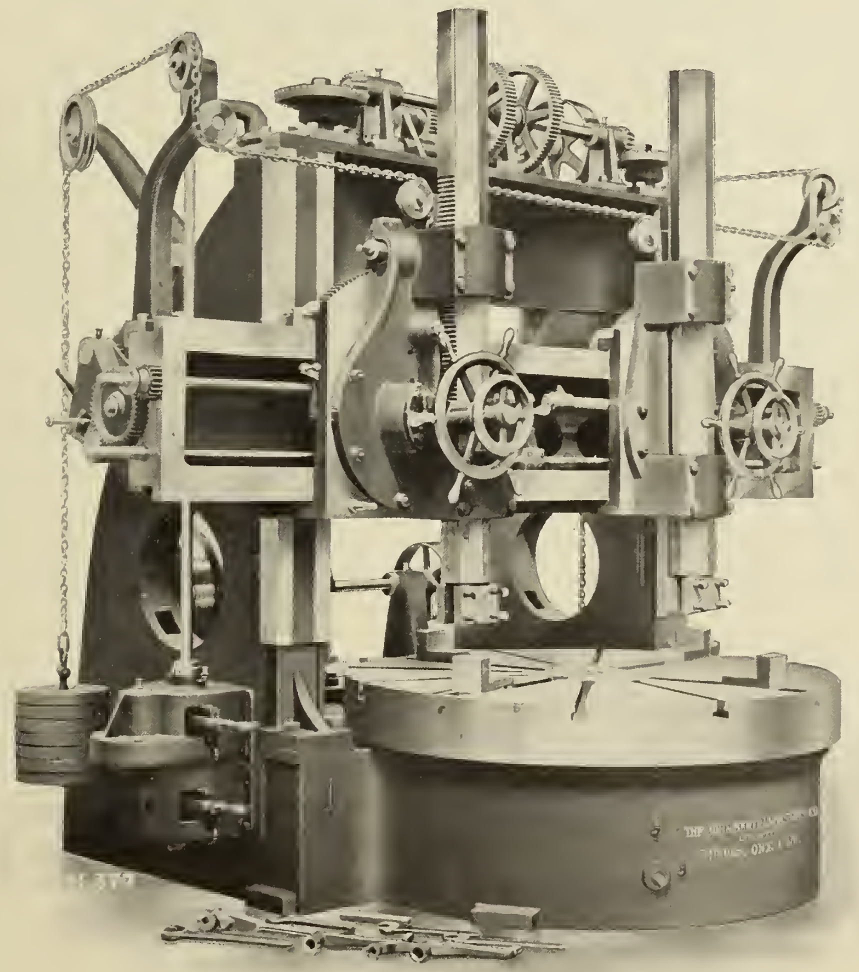
CIRCULATES EVERYWHERE IN CANADA

CANADIAN MACHINERY AND MANUFACTURING NEWS

A monthly newspaper devoted to the manufacturing interests, covering in a practical manner the mechanical, power, foundry and allied fields. Published by The MacLean Publishing Company, Limited, Toronto, Montreal, Winnipeg, and London, Eng.

MONTREAL, 232 McGill Street. TORONTO, 10 Front Street East. WINNIPEG, 511 Union Bank Building. LONDON, ENG., 88 Fleet Street, E.C.

Vol. IV. Publication Office : Toronto, August, 1908. No. 8



NEW SPLINE
MILLING MACHINE

An entirely new machine for milling slots with closed ends, key-ways, and an endless variety of other work

Fish Tail Cutters used in the Spline Milling Machine

SPECIMEN OF WORK DONE ON THE SPLINE MILLING MACHINE

This machine, embodying new principles, takes care of work for which heretofore there has been no suitable machinery.

Considering its use the designer may take advantage of the use of slots—which many times would simplify his designs, but which have in the past been avoided owing to the high manufacturing cost.

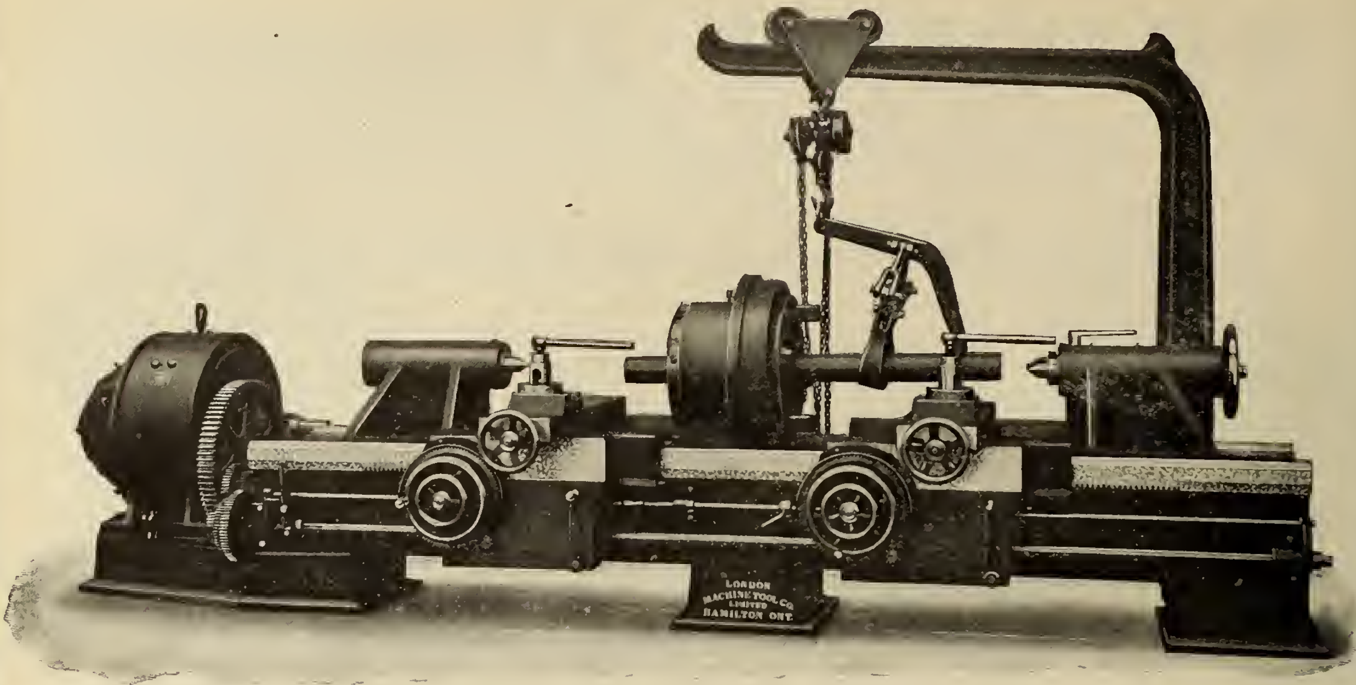
The great advantage of this tool will appeal to the manufacturer who has formerly been compelled to resort to expensive broaching operations or to hand milling for cutting key-ways with closed ends, and tang slots which, owing to their depth, require extreme care in manipulation of tools as well as the continuous services of a skilled operator.

Pratt & Whitney Company

HARTFORD, CONN., U.S.A.

SALES AGENTS—THE CANADIAN FAIRBANKS COMPANY, LIMITED

Montreal Toronto Winnipeg Vancouver



Extra Heavy Double Axle Turning Lathe

As arranged with 20 horse power Westinghouse Type S motor for Grand Trunk Railway System, Stratford, Ont.

¶ This is a lathe of great endurance, heavy, powerful, conveniently operated and rapid; designed for turning both ends of axles at the same time, and successfully meeting the requirements of High Speed Steel Service.

¶ Carriages are independent, conveniently arranged with three positive feeds for roughing and finishing cuts, operated and controlled by hand wheels placed within easy working reach.

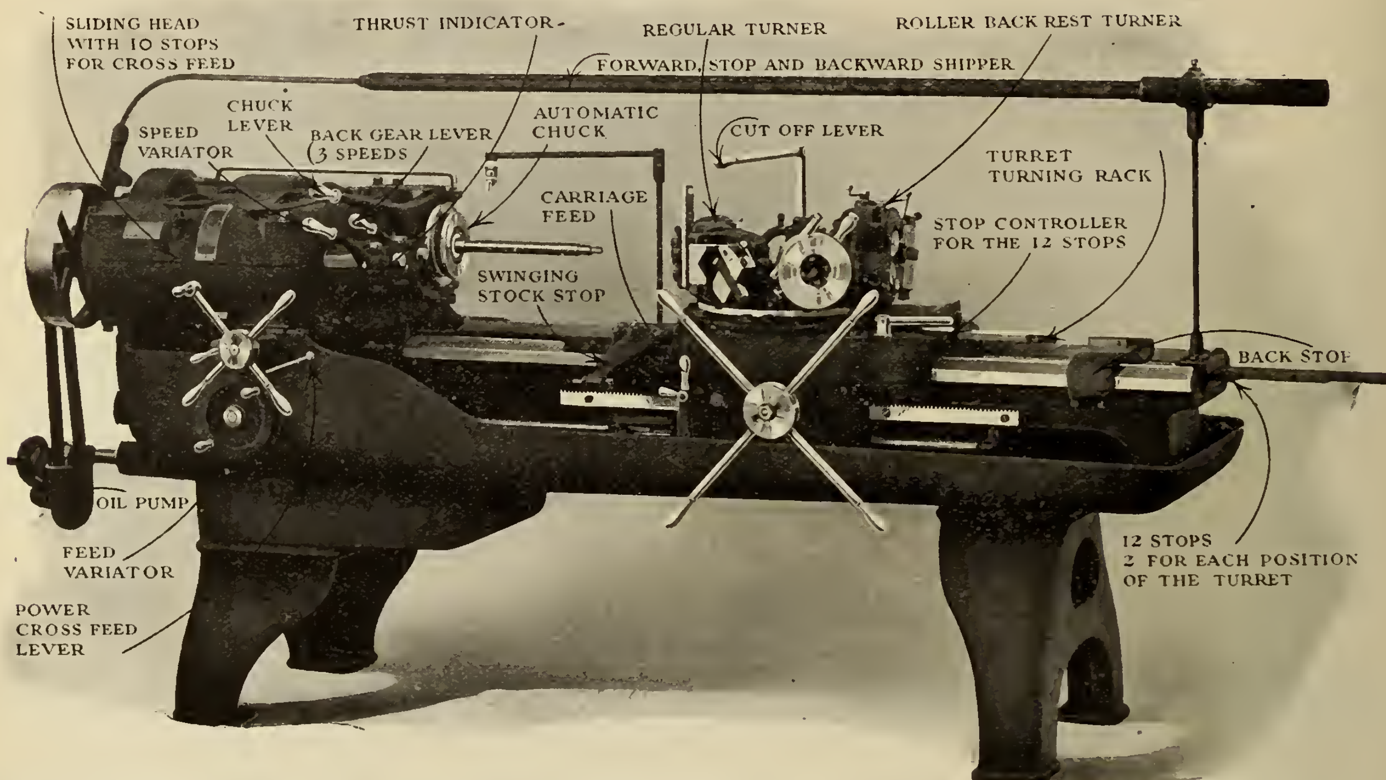
Write us for full particulars

London Machine Tool Co., Limited

Hamilton - - - Canada

THE

Hartness Flat Turret Lathe



Our entire plant is devoted to the building of Flat Turret Lathes exclusively. We have been following this policy of sticking to one thing for over twelve years.

SOME OF THE CHARACTERISTICS OF THE HARTNESS FLAT TURRET LATHE ARE

Originality in design—Unflinching control of work and tools

Accuracy of output

The Lathes are now equipped with outfit of tools for handling both bar and chucking work. This tool equipment is of the adaptable kind, taking care of all work within the range of machine—NO SPECIAL TOOLS REQUIRED. A change in your product does not call for a new tool equipment.

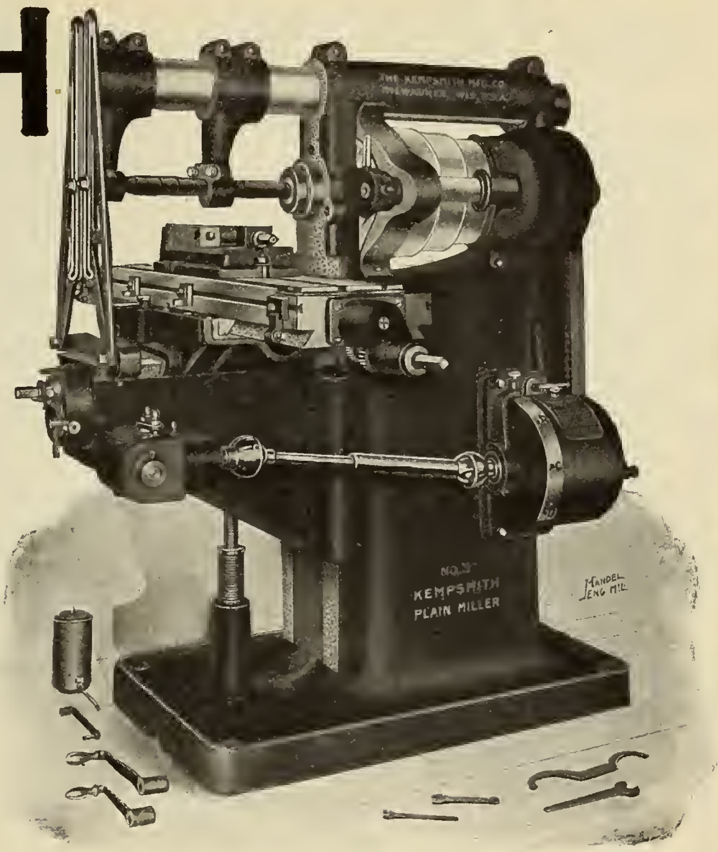
Our aim is to lead—not follow.

Our Catalogue gives full particulars, shall we send you a copy?

Jones & Lamson Machine Co.

Springfield, Vermont, U.S.A. and **97 Queen Victoria St., London, Eng.**

KEMPSMITH



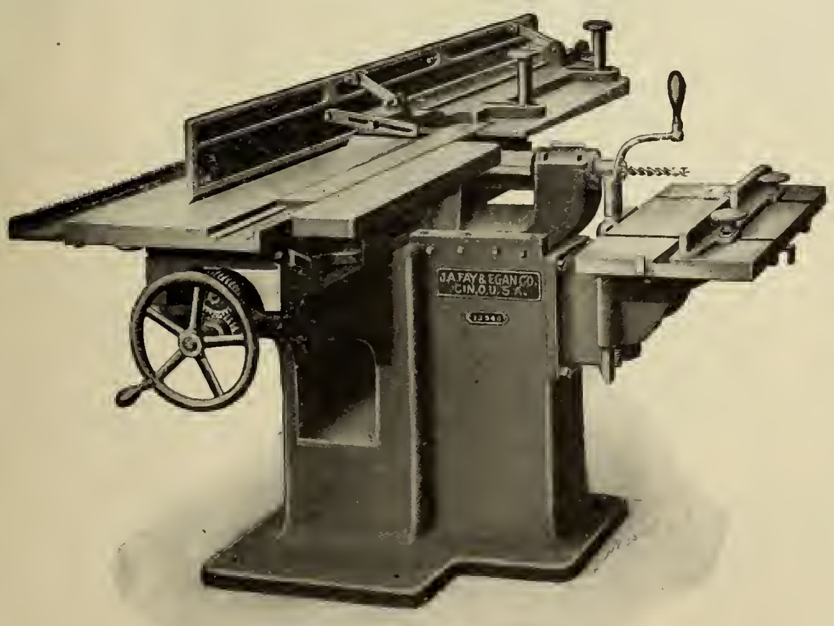
The entire arrangement of tripping feeds, centralized in ONE lever for ALL feeds, at front of knee—the powerful, simple and compact geared feed change mechanism—powerful and substantial construction throughout—these three very vital points only go to show the general excellence of this machine as the type of the modern manufacturing miller.

Fully shown in the catalog.
Prompt Deliveries.

The **Kempsmith Mfg. Co.,**
Milwaukee, Wis.

Canadian Agents: London Machine Tool Co., Ltd., Toronto, Can.

A WHOLE WOODSHOP IN ITSELF



No. 62 UNIVERSAL WOODWORKER

ARE YOU LOOKING FOR A MACHINE THAT WILL

plane out of wind, surface straight or tapering, rabbet door frames, rabbet and face inside blinds, joint, bevel, gain, chamfer, plow, make glue joints, square up bed-posts, table legs, newels, raise panels, either square, bevel or ogee, stick beads, work circular mouldings, etc., rip, cross cut, tenon, bore, rout, rabbet, joint and bead window blinds, work edge mouldings, etc ? If so, drop us a postal card, and we will send you a descriptive circular showing two views of our No. 62. UNIVERSAL WOODWORKER -- A WHOLE WOODSHOP IN ITSELF.

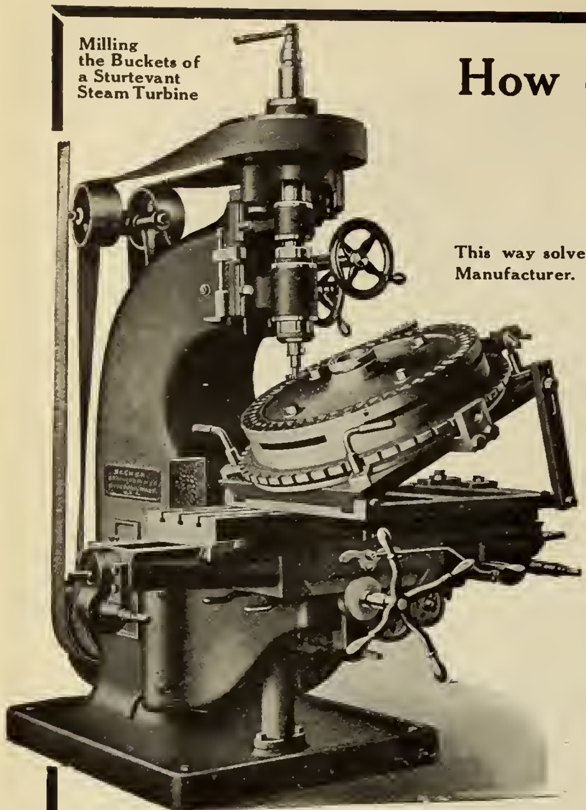
WE GUARANTEE THIS MACHINE TO DO THE ABOVE VARIETY OF WORK IN A FIRST-CLASS MANNER

WRITE TO-DAY

J. A. FAY & EGAN CO.,

362-382 W. Front St.,
CINCINNATI, OHIO.

Milling the Buckets of a Sturtevant Steam Turbine



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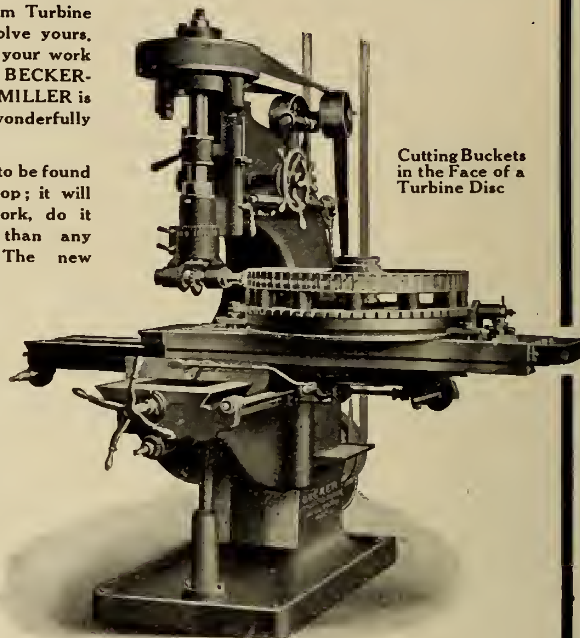

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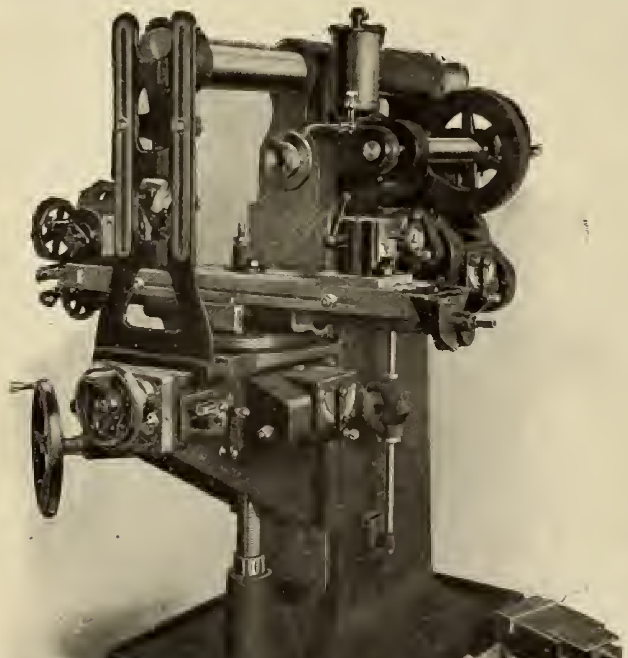

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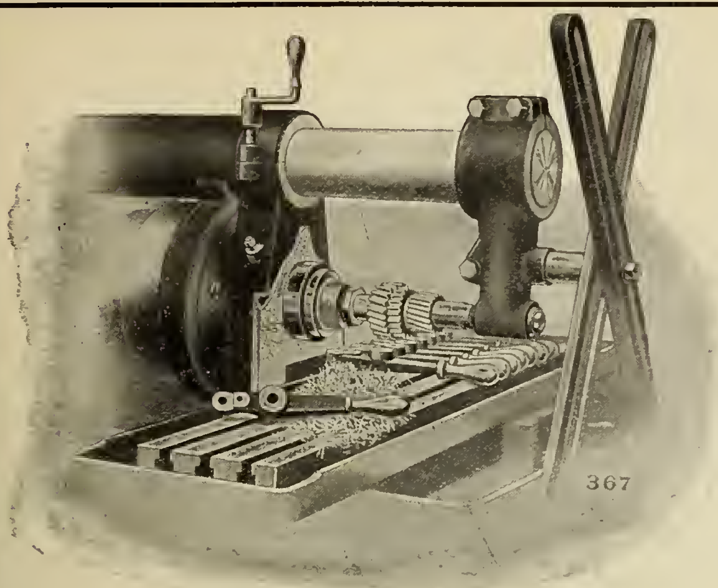

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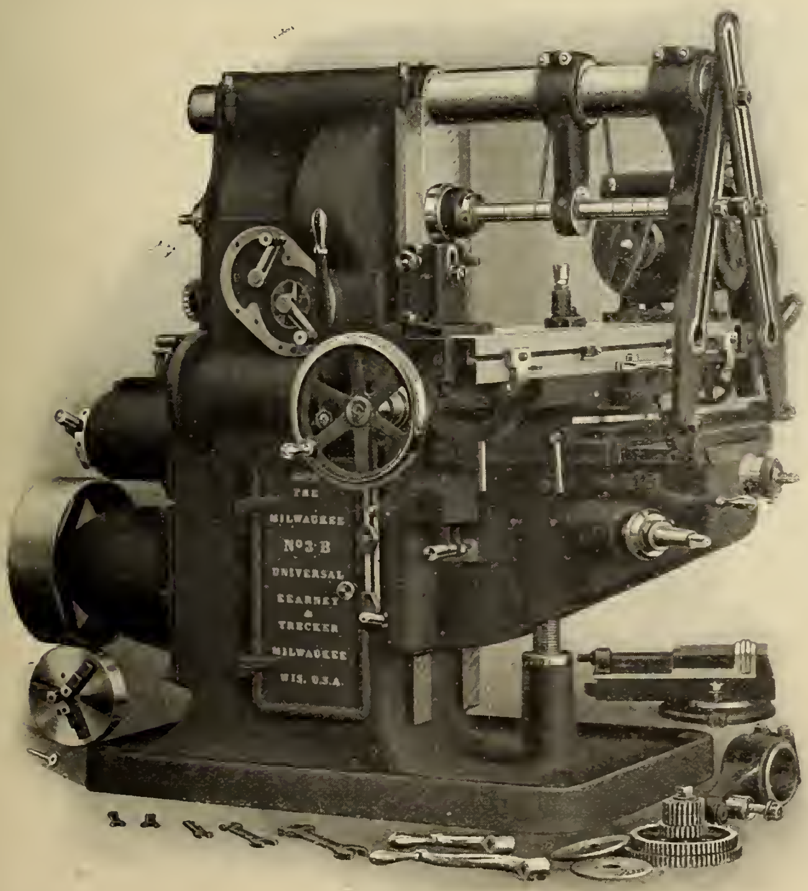

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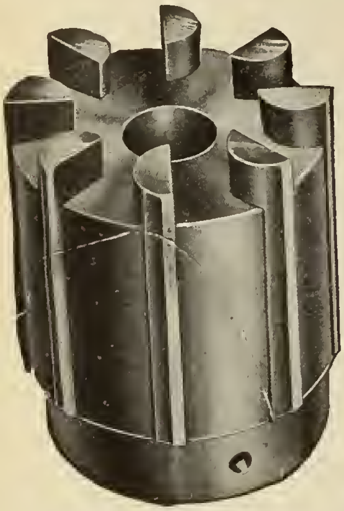

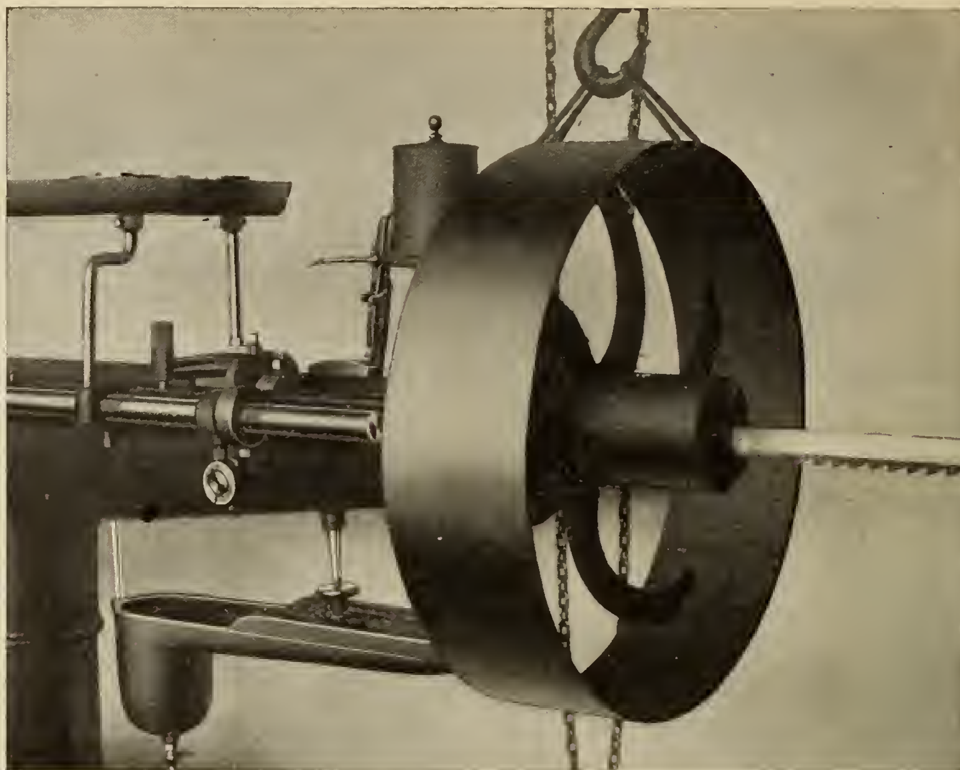

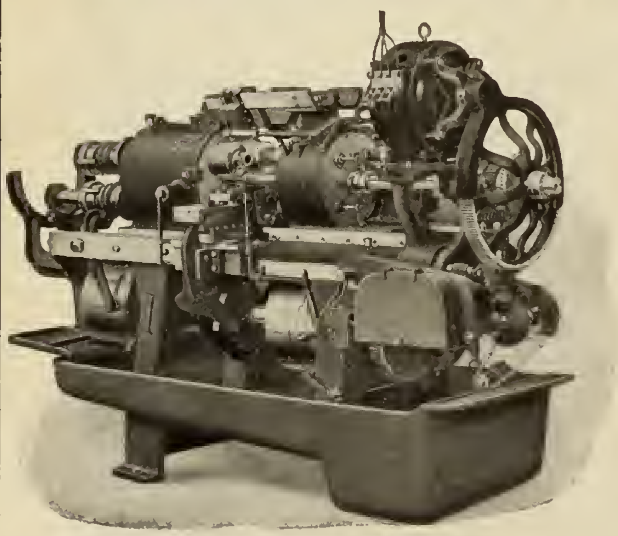

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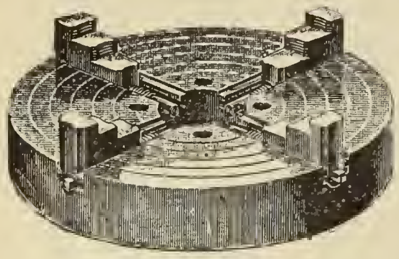

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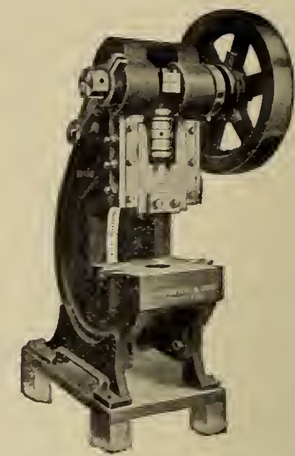

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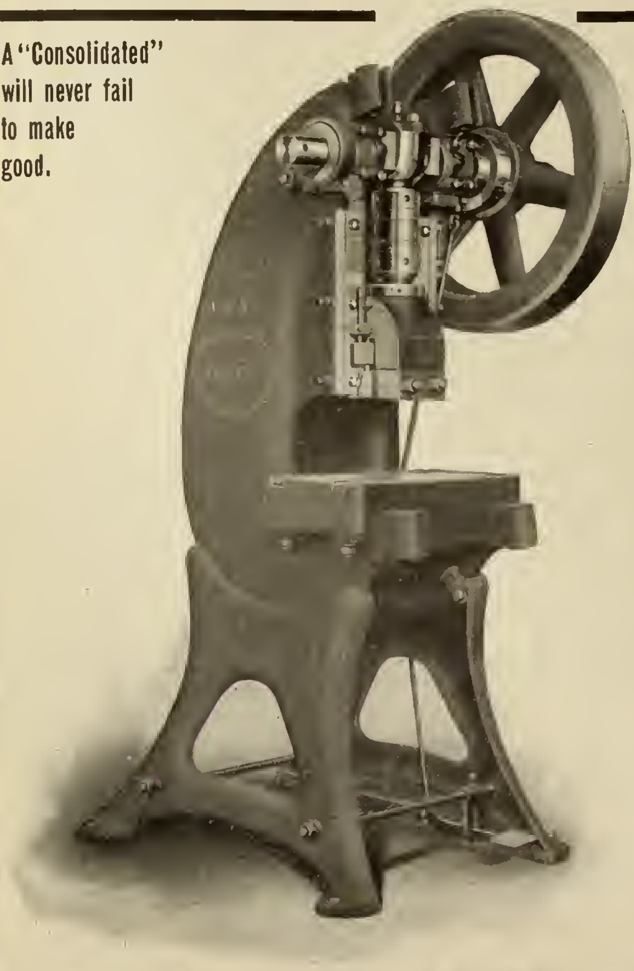

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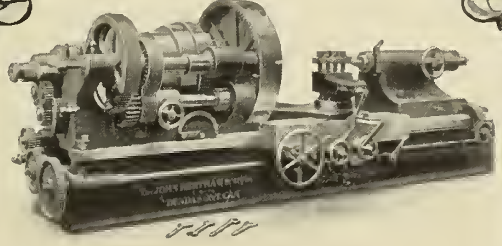

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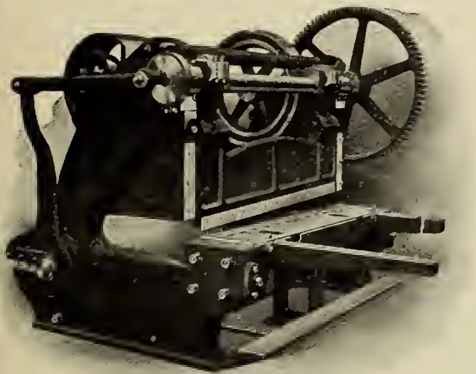

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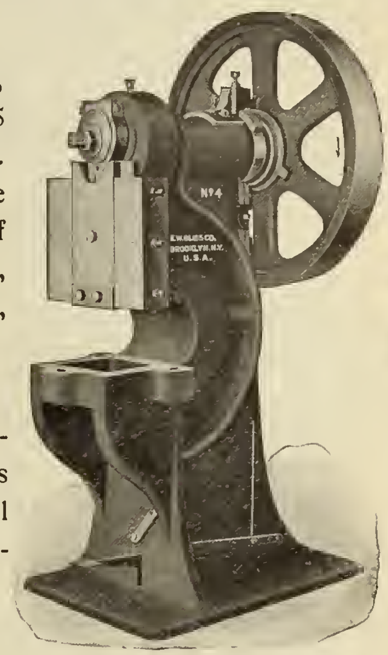

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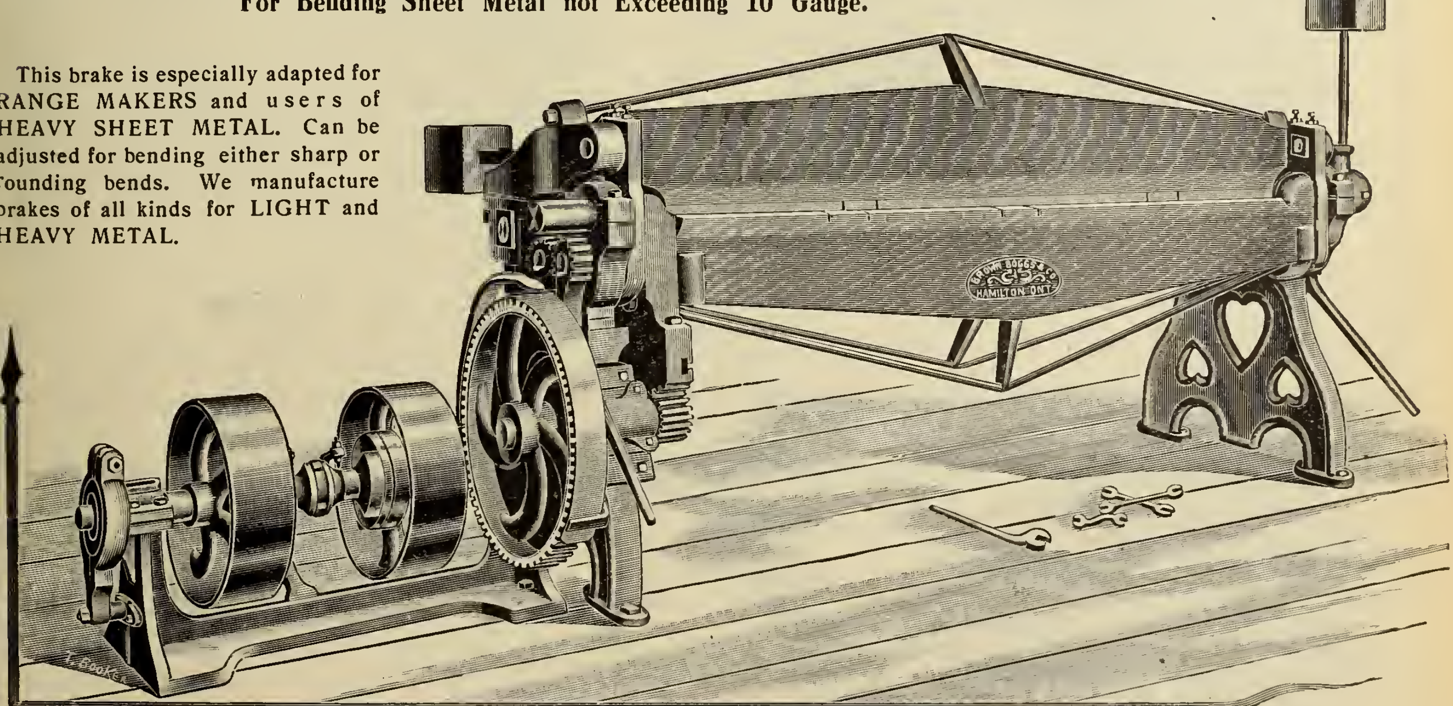

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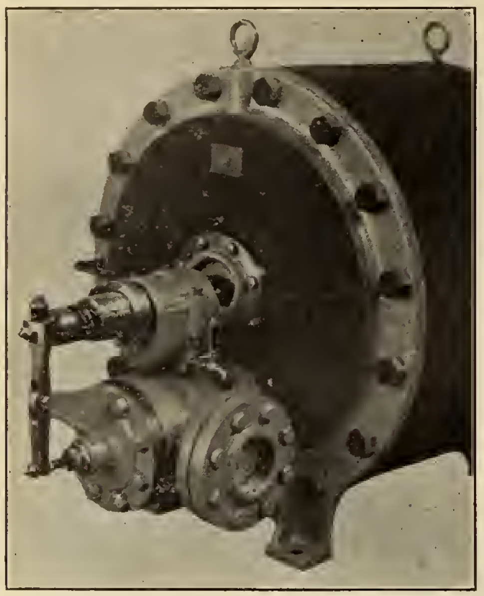

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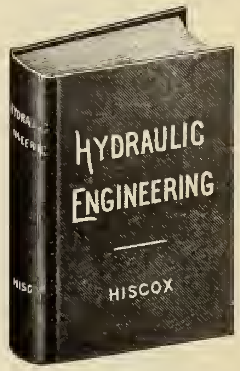

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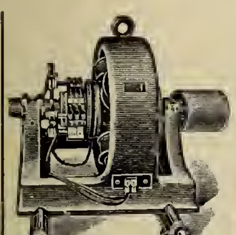

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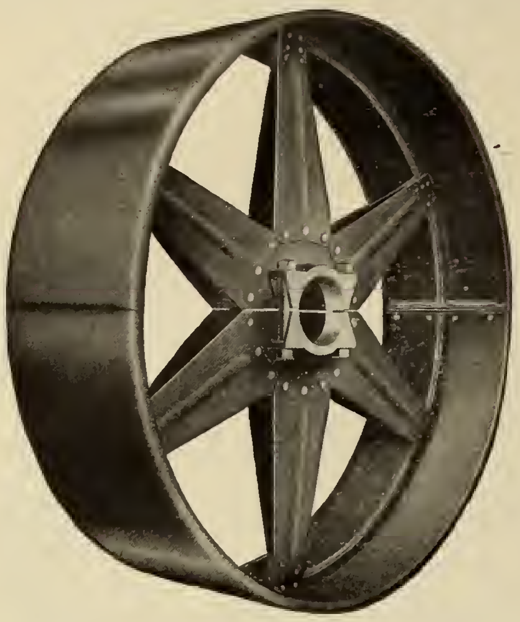

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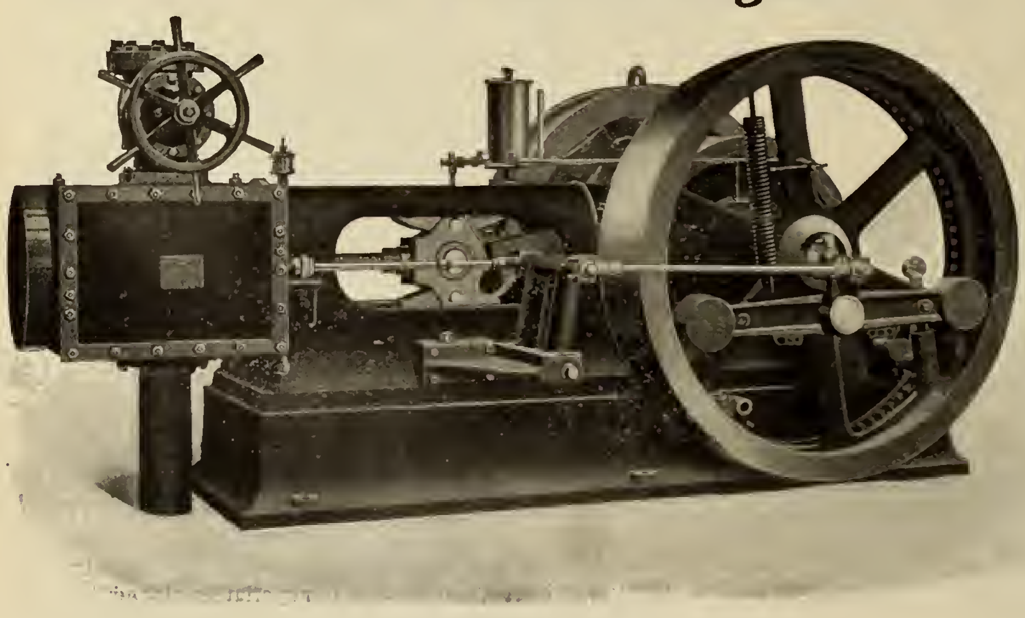

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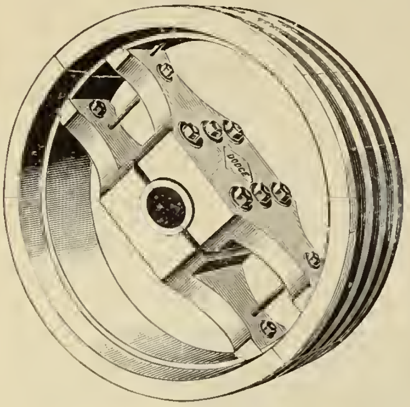

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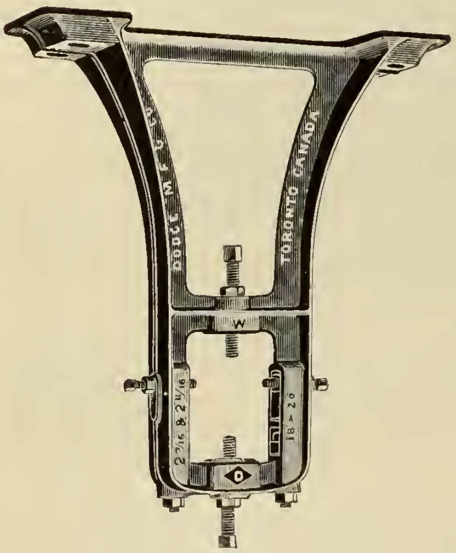

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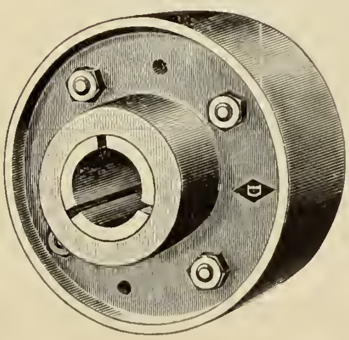

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By F. N. GARDNER.

This test was made at shops of the Gardner Machine Co., Beloit, Wis., to determine the comparative efficiency for grinding cast iron, of different kinds and makes of discs, such as are commonly used in connection with disc grinders. In following table the different kinds of discs are indicated by figures :

The grinding was all done on same machine by same operator.

The grinding was done on the ends of hollow blocks of cast iron as shown in Fig. 1. The area ground at end on blocks was 5 sq. in. Reducing the blocks one inch in length, indicated the removal of 5 cu. in. of metal.

amount of metal removed noted. This was repeated until disc was worn out or the blocks all ground up In the latter case, new blocks were substituted and operation continued until disc was worn out. By reversing the blocks they were ground down until wheel touched the handles, on both sides.

Disc Number	Time Used in Minutes.	Stock Removed in Cubic Inches	Number of Times Dressed.	Average Cutting Rate—Cubic in. per Min.	Cutting Rate First Half of Time Used.	Cutting Rate Second Half of Time Used.	Life of Disc Based on Disc No. 1.	Stock Removed Based on Disc No. 1.
1	754	349.85	0	.464	.442	.486	100. %	100.0%
2	137	42.13	6	.307	.344	.270	18.1%	12.4%
3	540	113.95	0	.211	.238	.184	71.6%	32.3%
4	68	27.97	2	.411	.546	.276	9.0%	8.0%
5	71	2.41	4	.034	.062	.006	9.4%	0.7%
6	73	12.48	2	.171	.273	.069	9.7%	3.5%

Test On Efficiency of Abrasive Discs.

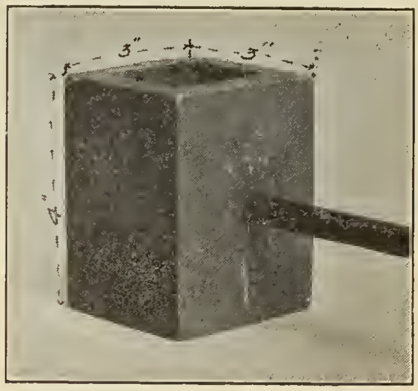


Fig. 1—Cast Iron Test Blocks.

No. 1 indicates Gardner improved abrasive disc, "No. 126." It is further described in this article. No. 5 is regular No. 24 commercial emery cloth. No. 6 is same in emery paper. Nos. 2, 3 and 4 are proprietary articles of excellent quality as compared to commercial emery cloth, and all are well-known by trade names and are extensively used.

The discs tested were all 20 inches in diameter, and all excepting Nos. 5 and 6 were No. 16 grain.

In Fig. 2 is shown the method of handling the work and twelve blocks which have been considerably reduced from original length. Usually twelve blocks were operated on together.

The micrometer stop at back of table was set to grind off a fixed amount, usually .050 inches, and the twelve blocks ground to the stop. Stop was then moved back .050 in. and operation repeated until block became too warm for efficient grinding ; blocks were then cooled, time of grinding and

During these tests several hundred pounds of these blocks were converted into cast iron chips.

In the following table it will be noted that it was necessary to use a Huntington emery wheel dresser on all discs tested except Nos. 1 and 3. The dresser was used whenever surface of disc became dull and glazed, so that it would not cut cast iron readily.

The use of a dresser shortens the life of disc, but it was absolutely neces-

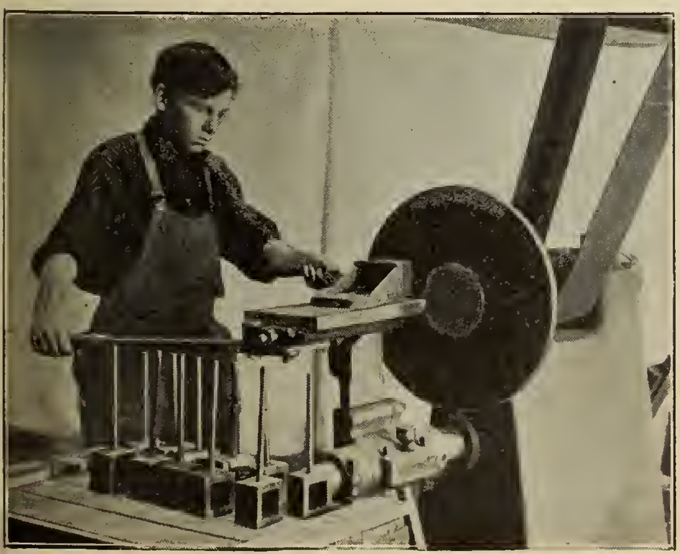


Fig. 2—Method of Handling Work During Test.

Fig. 3—Grinding Propellers With Disc No. 1.

sary. The results obtained are as per following table :

Manufacture of No. 1 Disc.

The disc called No. 1 in the foregoing table is made by an entirely new process. The abrasive grains are mixed with required bond and the mixture is cemented to a cloth backing. While in a plastic condition the abrasive grain are mechanically tilted to an efficient cutting angle. Careful examination of a disc treated by the tilted process will fail to show any large grains with large flat faces fixed parallel to the plane of rotation. On the other hand, before being subjected to this tilting process a great majority of the grains present their largest flat surfaces parallel to plane of rotation, i.e., surface of work being ground. It is obvious that the flat side of a grain will not cut so freely as a sharp edge. The truth of this is evident from results shown in table.

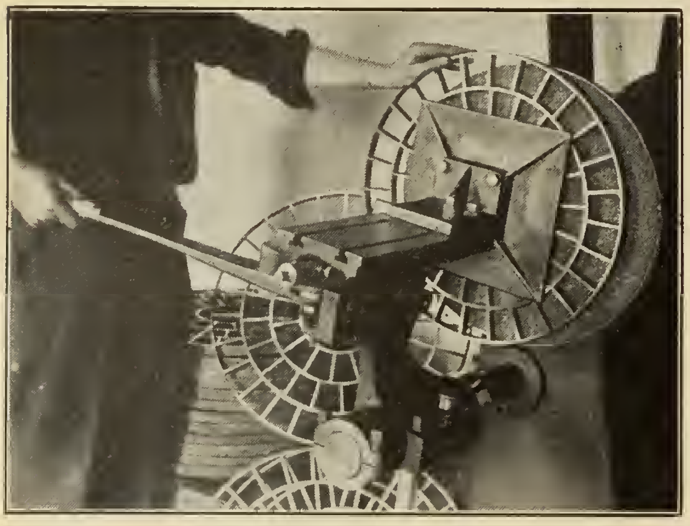


Fig. 4—Disc Grinding Cast Iron Lattice

Fig 5—Squaring the Ends of Cast Iron Boxes.

Another very noticeable feature of the No. 1 disc is the uniformity of its cutting efficiency from start to finish. As shown in table, the disc removed stock just as fast the last six hours as it did the first six.

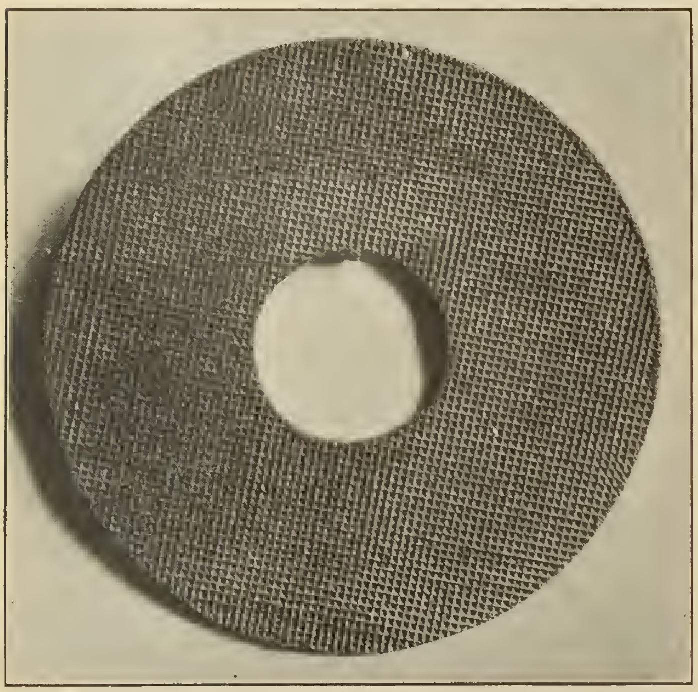


Fig. 6—No. 1 Disc Used in the Test.

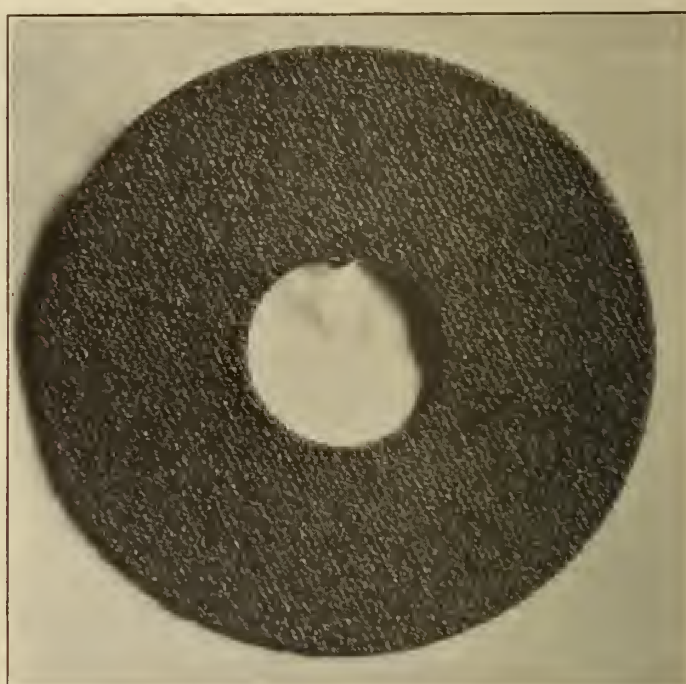


Fig. 7—Same Disc as Fig. 6: but of Fined Material.

All the other discs tested are made by depositing a heavy coating of glue on the backing sheet and then spreading a quantity of dry abrasive grains on to the glue. The abrasive grains settle into the glue and so become firmly attached to the backing sheet. By this process the grains and glue are not evenly mixed from face to back. Discs made in this way cut freely and rapidly at first, but soon wear down to a point where there is too much glue and not enough of the abrasive grains. This fact is plainly evidenced by record of disc No. 5 in columns, giving average cutting speed for first and second half of the time used.

Variety of Work Ground With No. 1 Disc.

The accompanying cuts Fig. 3, 4 and 5, show operations on work done with

disc No. 1. Fig. 3 shows grinding of impellers for centrifugal pumps. These were gray iron castings and were very rough and hard in places making them difficult to machine in a lathe.

Diameter is 26 inches. The area of surface ground is about 50 square inches on each side. It was necessary to remove ¼ inch thickness of metal at some points. The rate of grinding these impellers on both sides was fifteen minutes for each impeller. Former time for turning in lathe was three hours and thirty minutes for each impeller.

The pieces are ground at an angle of 7 degrees to the axis, and the surface of the blades being curved and not radial, necessitates their being revolved while grinding. This develops the surface of the cone.

The impellers are mounted on a spindle driven by worm gear and worm connected with hand wheel, as shown. This fixture is mounted on a lever feed table set at required angle with face of disc wheel, and the impeller is slowly revolved by means of a hand wheel while the lever is used to bring it against the disc wheel.

Fig. 4 shows a rather interesting job on disc grinding of special cast iron latticed plates. These plates are used in the manufacturing of the discs No. 1 in accompanying table and are required to be accurately flat and of uniform thickness. They are 23 inches in diameter by ⅞ inches deep. The rings and spokes that go to make up the plates are 5-32 inches thick. The castings being so thin it was found to be impracticable to machine them in a lathe or boring mill, but results obtained with a disc grinder are entirely satisfactory.

The plates are chucked at the inner circle, which is about six inches in diameter, on a metal disc having heads of set screws projecting from its periphery. This disc has ⅞ inch hole in centre fitting a stud in the angle plate, which is bolted to top of lever table as shown. The latticed plates are hung on this stud, bearing against the angle plate, and are pressed against the disc wheel by the lever. They are, of course, free to revolve with the wheel, but the speed of this revolution is easily controlled by changing the relative position of the stud to the axis of the machine spindle, and also by the hand of the operator, as shown. By changing pressure on the lever and by swinging table on the rocker shaft the revolution of the plates can be increased, stopped entirely or reversed at will of the operator.

The castings for the plates are made in a stove foundry and are quite accurate to pattern, but too hard to turn. The amount of metal to be removed to make them accurately flat, is small, averaging less than 1-32 inches each side. By the method shown they are finished to required size and made flat on both sides in about fifteen minutes.

Grinding Babbited Boxes.

Fig. 5 shows an interesting operation of squaring the ends of cast iron boxes, after they have been babbited. In the lot shown, some of the caps lapped over or fell short of the base as much as ¼ inch, and it was necessary to remove more than that thickness on both ends of the box to fully square and face them.

Boxes shown are for 2 7-16 inch shaft. Total area of surface ground on each box was 16 square inches. 73 boxes were ground on both ends in fifty-nine minutes, or at the rate of seventy-five per hour. This work was done with the discs called No. 1 in table, but it was coated with a special preparation that prevented babbit from clogging the disc.

It will be noted that the boxes are simply slipped on to a freely fitted stud set in an angle plate, which is bolted to top of lever table, this enables the operator to handle them rapidly, and by use of micrometer screw stop, correct length can be maintained.

Figures 6 and 7 are reproduced from photograph of Gardner's "improved" abrasive discs.

Fig. 6 shows No. 1 disc used in above grinding test.

Fig. 7 is the same kind of disc, but made of a much finer abrasive and being lighter in color, shows very plainly the corrugated surface which produces the "mechanical tilting" of the abrasive grains.

Electro-Galvanizing in Plant of the Frost Wire Fence Co.

Manner of Conducting Electro-Galvanizing, or Cold Galvanizing, in Hamilton Factory—Advantages of Cold Over Hot Galvanizing.

Three years ago the Frost Wire Fence Co., Hamilton, had one small tank and revolving barrel for zinc plating or cold galvanizing, as it is commonly called, the small parts for their fences. Now the company have quite an extensive cold galvanizing department, where, in addition to parts for fences, much job work is done. Figs. 1, 2, and 3 give an idea of the galvanizing room, and show the nine tanks, the one for large work being quite in the foreground of Figs. 1 and 2, and only partially shown.

Advantages of Electro-Galvanizing.

The advantages of electro-galvanizing, or cold galvanizing, over the hot process, as found in this plant, are, briefly: Small pieces which would be difficult to handle in hot process, can be efficiently galvanized with little trouble, very great saving in spelter; no fuel used as in hot process; the labor is very much less; the coating can be regulated to any required thickness; the process does not affect the nature of material being galvanized, as for instance, spring steel bicycle wire is galvanized without affecting the temper; bolts and nails are galvanized in this plant and the barb on the nail and the thread on the bolt is retained in perfect condition, whereas with the hot process these would have been filled in, requiring rethreading in the case of the bolts. In this plant parts of wringers and dairy machinery are galvanized, and because of no thread being filled up or other holes or corners a second machining is not necessary; when efficiently carried out, this process is much cheaper than the other; perfect evenness of coating, thus requiring a minimum amount of zinc.

Galvanizing by the hot process has the disadvantage that the coating is uneven and that therefore a large quantity of zinc is necessary to insure a coating that will have at any point a maximum thickness

It is all wrong to believe that any zinc coating on an iron surface will afford protection, however it is applied. The looks of a zinc coating do not prove anything. If one were to study with the eye the quality of the coating it would be necessary to observe with the microscope the connection between the iron and the zinc. The quality of the coating depends essentially on the molecular joint or weld, so to speak, between the iron and the zinc, and it is for this reason that the method by which zinc is put onto the iron is of enormous importance.

Solution Used for Galvanizing.

The solution used is a mixed solution of zinc sulphate and aluminum sulphate, about 75 per cent. of the former and 25 per cent. of the latter. It is in this solution of course, that the success or

failure of the process depends in a large measure.

Construction of Tanks and Barrels.

A glance at one of the illustrations will give a good idea as to the construction of the tanks. The barrel is driven from an overhead shaft, through the large pulley and gearing which meshes as clearly shown in the foreground of Fig. 3. The two sets of bearings are contained in upright planks separate from the tank, in order that the barrel can be lifted from the tank by the overhead hoist for filling and emptying, as shown in the background of Fig. 3. The barrels are made of wood and celluloid, perforated, size 5 feet long by 10 to 16 inches in diameter. The speed at which these barrels are run is 5 R.P.M.

The anode consists of plates of pure zinc suspended from the copper bar that surrounds two sides of the tank. The kathode is of course the material in the barrel which is being plated. The tanks are wired with the three-wire system, and each tank has a double-throw switch with which 5 or 10 volts can be thrown across the electrodes. Pieces with deep recesses require the ten volts to ensure a good coating.

Cleaning Material for Galvanizing.

To follow the material consecutively through the different stages of the process, something should be told concerning the preparation of the material. As in all electro plating, the material must be absolutely clean before it goes to the plating bath. If the material be malleable or grey iron castings, all the sand and other foreign substance must be removed; if stampings or machined pieces from the machine shop, all the grease and oil must be removed. The cleaning is done with potash and acid baths. In the case of malleable and iron castings they are first freed from all sand and scale in an acid bath, after which they are thoroughly washed in a cleaning mill running in water. Steel stampings, which have been stamped in oil, are tumbled in dry sawdust mills before being cleaned in the potash solutions.

These acid and potash solutions are warmed by steam pipes in the bottom of tank. These tanks are lined with lead sheets and the steam pipes are lead. Small pieces are soaked in these baths in large graniteware pots, which are profusely perforated.

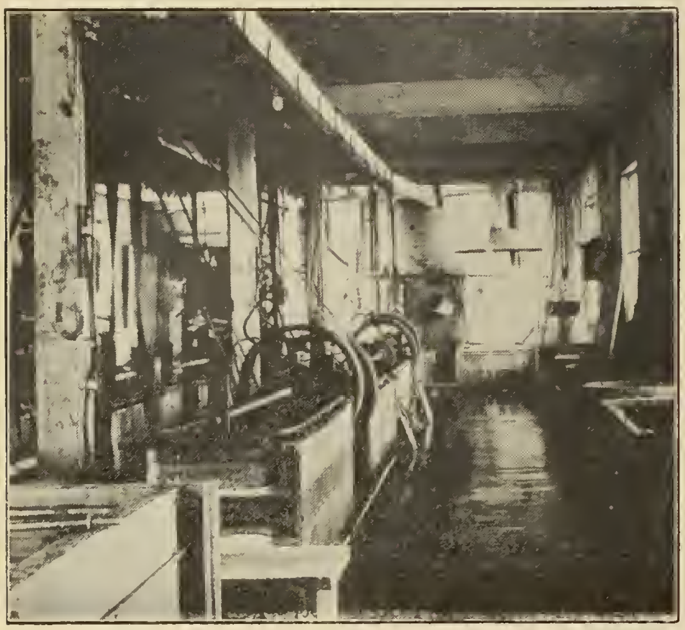


Fig. 1—View of Galvanizing Room.

Fig. 2—View of Galvanizing Room.

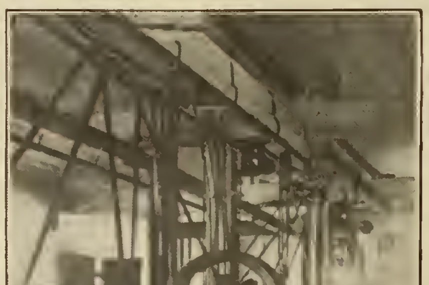


Fig. 3—Showing Galvanizing Barrel Removed from Tank.

The material is washed in water in the same pots and is then ready for the galvanizing tank. The galvanizing barrel of this size, previously mentioned, will efficiently contain from 150 to 300 pounds of material, depending upon the size of the pieces. The time required for galvanizing nails is from 3 to 4 hours, when on the 5-volt circuit. If on the 10-volt circuit, less time will be required. This will give an idea of the time required for other pieces.

Upon completion of the galvanizing, the barrel is lifted from the tank and the material dumped into a perforated trough. This trough is lowered into tanks of cold water, several of which can be seen along the right-hand wall in Fig. 1. Here the material receives a thorough washing and is transferred to a truck containing a wire frame, upon which the material is spread out. One of these trucks can be seen in Fig. 3.

The truck is then moved into the drying room, which is heated with natural gas.

The cost of galvanizing as carried out in this plant varies somewhat of course with the different material, but an average cost is one-half cent per pound. Considerable job work is done and the average price received for it is one and one-half cents per pound.

After being plated the pieces can be polished in tumbling barrels.

The zinc electrodes are removed each morning and scraped and brushed to remove the impurities which are left on the surface, or pickling over night in a weak acid solution will clean them thoroughly.

Design and Manufacture of the Worm and Gear Drive

Good Practical Data for the Design of Worm and Gear Drives; and Some Points Relative to Their Construction Under Ordinary Shop Conditions.

By JOHN EDGAR

If the object of this article were to include all the data and the different theories that have been produced on this interesting mechanism we would have a ponderous volume; but we are fortunate in being able to design a very successful drive with very little abstract theory. In fact, we have at present so much actual experimental data which has been narrowed down to the simple axiom of steep angle and coarse pitch, that one can, with a little judgment on his part, design a drive for a given purpose without the least apprehension of failure.

Consideration of Efficiency.

It is common knowledge that all failures in this type of transmission device are due to the failure of the tooth surfaces to withstand the working load for any length of time. This failure is due to excessive friction between these surfaces. It can be shown that, by increasing the pitch of the thread and consequently the angle, the friction between the surfaces in contact is reduced. Chart in Fig. 1 shows the calculated efficiency of worm and gears exclusive of the steps for angles from 0 to 90 degrees. These values are calculated from Professor Barr's formula. Examples from practice follow this curve quite closely. It will be observed that the efficiency of the drive increases very rapidly with the angle for values up to about 10 degrees, and slowly for values from 10 to 75 degrees where it begins to decrease rapidly until the 90 degree angle is reached. The thread has the maximum efficiency at or around the 45 degree mark.

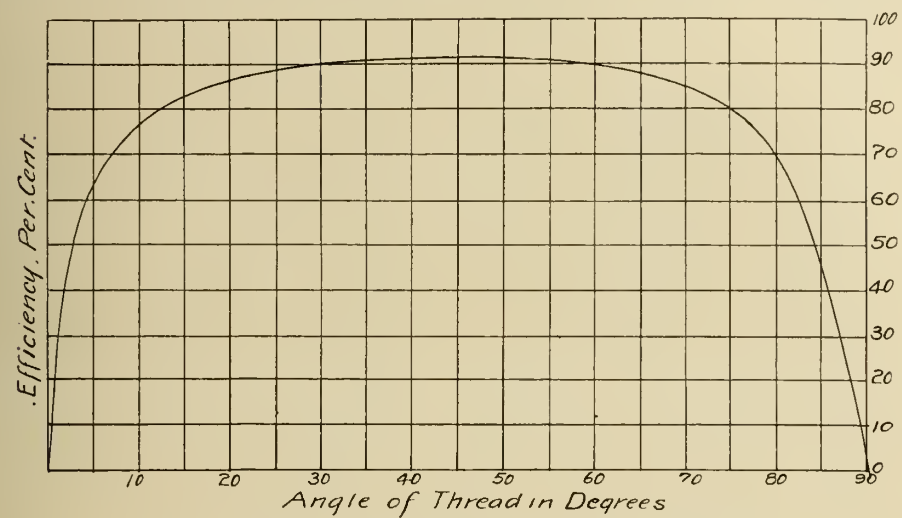


Fig. 1—Relation Between Thread Angle and Efficiency.

Experience has shown that worms with thread angle under 12 degrees are liable to cause trouble when required to transmit moderate or heavy loads. All examples with angles under 9 degrees are reported as failures.

Speed also has a very important part to play in the success or failure of a worm gear drive. The combination of low speed and heavy load is such as to impose high pressure of contact. It should be the aim to reduce this pressure of contact and to do this the surface speed must be increased; but there is a limit to the desirable speed. It has been shown that the practical limit to this speed is about 200 feet per minute. While isolated cases may be cited where the speed is greater, we can only explain it by assuming that the pressure of contact must be light. The efficiency decreases at a much greater rate than the speed for all speeds under 200 feet.

When we have a worm tooth that satisfies all the conditions of wear we may feel satisfied that it will be sufficiently strong to withstand the load against breakage.

The Form of Tooth.

Coming now to the more practical side of the subject, that of tooth form. We have but two forms of tooth that are applicable to the case, viz., the cycloidal and the involute. The former has given place to the latter to such an extent that it need have no place in this article. In the involute we have a system of tooth shapes that is very flexible. In general practice, especially for small work, the 29 degree thread is the most common. This system corresponds to that on which the interchangeable system of spur-gearing is based. The worm thread is given on a longitudinal section through the axis a shape

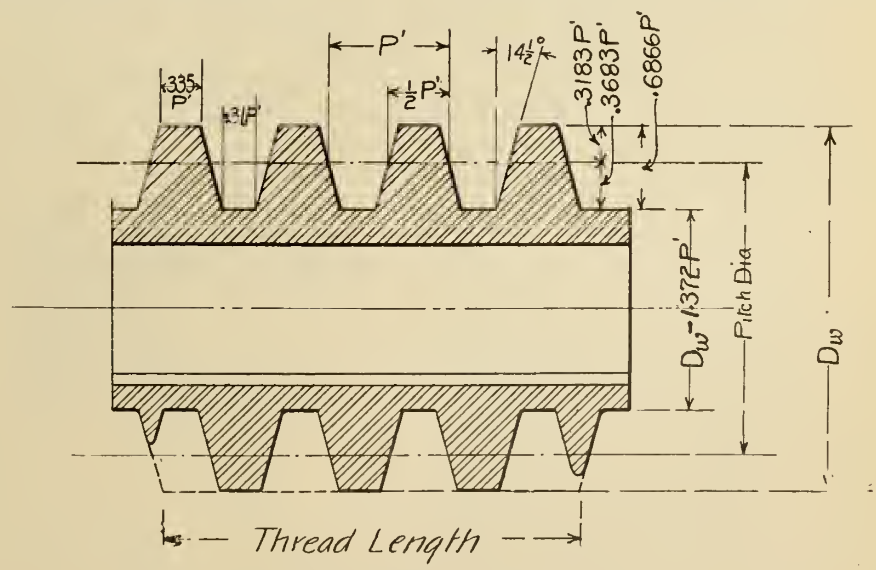


Fig. 2—Section Through Worm.

similar to the involute rack with ıight sides inclined at an included angle of 29 degrees. This shape of thread is easily produced in the lathe.

Fig. 2 gives a section through a worm showing the shape of the worm thread. In this figure P' is the linear pitch of the thread, and equals the distance from one thread to the other, or on a single threaded worm it equals the distance along the axis that a point on the thread travels in one turn. In mul-ǝ threaded worms the distance that a point on the thread travels in one turn is called the lead, and the pitch ir this case is equal to the lead divided by the number of threads. All other dimensions given on the figure are dependent on P'.

To Design Worm and Gear.

Before we are in a position to decide upon the dimensions of the worm we must have the centre distance between the shafts and the desired ratio of their speeds as well as the speed of either one. The problem is usually set before us in somewhat the following form: Design a worm and gear drive to connect two shafts at right angles and at a known distance apart.

The velocity ratio of the drive is the number of teeth in the gear divided by the number of threads on the worm. Thus, in the case of a double threaded worm and a 40-tooth gear, the velocity ratio is 40÷2=20.

The way to proceed in the above case would be to calculate the diameter of a worm, at pitch line, that would give a velocity of pitch line of 200 feet. This velocity should really be calculated along the thread helix and would correspond to 200x cosine of thread along the pitch surface so that when the thread is to be a steep lead affair the value of the speed may be reduced to 150 in this calculation along the pitch surface so as not to exceed the 200 feet value. When we have the diameter of the pitch circle of the worm, we may find the diameter of the gear from the outer distance between the shafts. The lead of the worm should now be found for the desired angle or vice versa. See Fig. 3, which shows this graphically. The lead should be such that it can be cut on a lathe or milling machine. Some juggling may have to be done at this point in order to use the ordinary gear equipment. In choosing a lead to cut on the lathe it is better to adhere to whole numbers and abinomial fractions, as most lathes are equipped for such leads; whereas, in the use of the milling machine the lead may be almost any value. Steep angle threads cannot be cut on the milling machine successfully, unless by the aid of end mills, on account of the interference of cutter on the side of the thread in the case of the ordinary disc cutters. In some cases it may be an advantage to use diametral pitches instead of the ordinary circular pitch. Diametral pitches are made equal to the diameter of the gear divided by the number of teeth in the gear; thus, a 10-tooth gear 10 in. diameter would be a 1-pitch gear and the circular or linear pitch of gear or rack would be 3.1416 inches.

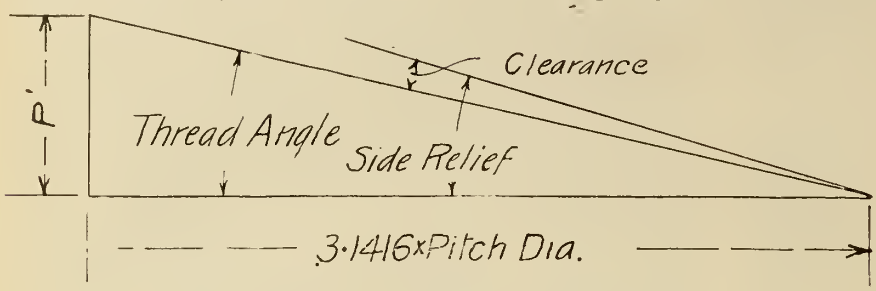


Fig. 3—Method of Obtaining Thread Angle.

After having obtained the principle dimensions of both gear and worm lay out the gear according to Fig. 4 where all other dimensions are given in terms of the pitch P'. The only arbitrary value in this figure is the angle of embrace, which may have any value up to 90 degrees 60 degrees being most generally used, the higher values being used for worms of relatively small diameter and coarse pitch. The throat of the gear should be sized accurately to the dimensions obtained from Fig. 4.

The dimensions of the worm may now be obtained from Fig. 2. The threaded length of the worm should be long enough so that a full engagement of the thread and teeth is obtained. To find the minimum length resort to the layout shown in Fig. 5. This is laid out as follows: Set the compass to equal the throat radius or one-half the throat diameter, and draw the arc A B from the centre O. Lay out on the radius the working depth of the tooth =0.636 P', and draw an arc through this point about the centre O. A line is drawn tangent to this arc and produced to cut the throat circle. The length of this cord is the minimum length of the threaded portion of the worm. In practice it is well to exceed this by an amount equal to one-half the pitch P'. This threaded length is indicated on Fig. 2.

The Making of Worm and Gear.

The tool with which the worm is threaded is shown in Fig. 6. This tool is made similar to the ordinary threading tool. It is important that the point be made correct in width and square with centre line. The angles of the sides should also be formed with care and be ground to a gauge. A gauge containing notches corresponding to several commonly used pitches may be obtained from any hardware dealer. Where much worm threading is done such a tool is very handy. But for occasional use a template may be made to answer the same purpose quite as well. Unless the angle of the thread of the worm is extremely steep, the tool may be made without side clearance. Should we have a worm of coarse pitch and large diameter, side clearance will have to be provided. The amount to remove from the side of the tool may be found by adding the clearance angle to the thread

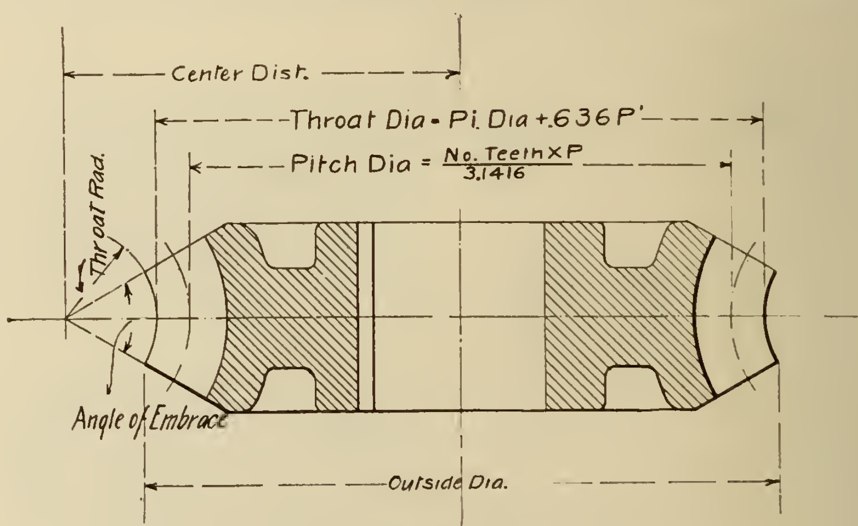


Fig. 4—Section Through Worm Gear.

angle found in Fig. 3, and the tool ground off to the angle C on the leading side.

The teeth of the gear are usually formed by hobbing. In which case much depends on the condition of the hob as to the accuracy and smoothness of the tooth shape. A hob not correctly made will produce very poor results and a gear so hobbed will, even with the greatest amount of care taken in its design, give very unfavorable results and in durability tests will prove to be short lived. So that the greatest of care should be taken in the preparation of the hob. Most hobs are made an exact duplicate of the worm with the possible addition of a small increment to the diameter.

Fig. 7 gives the correct shape and dimensions of the hob teeth, and as will be noted, the corners of the teeth are rounded and the roots provided with filets. The rounded corners are so made that the surface of the tooth formed on the gear may be made under the most favorable circumstances. It is easy to imagine the scratchy nature of a hob made with sharp corners. While the filet serves two purposes: first, it

diameter of the worm and the pitch of the thread. The hob is generally made longer than the worm, unless the work is to be hobbed in a regular hobbing machine; then the hob is made to suit the space provided in the machine.

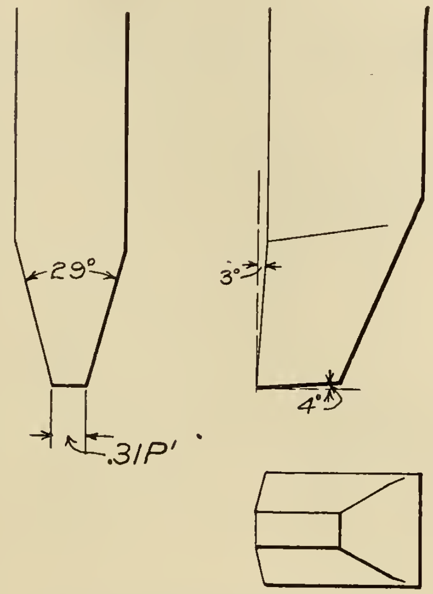


Fig. 6—Worm Thread Tool.

easily followed. The same may be said about side clearance as was the case in the thread tool. More care is necessary in the shaping of this tool than was necessary with the thread tool in Fig. 6, because sides of the form must bear the proper relation to the bottom and point as to angle, and the latter must be parallel with each other.

The hob blank should be rough threaded with an ordinary thread tool, so that the majority of the stock may be removed. After the blank has been roughed out the flutes should be formed. This is done by milling. The number of flutes to cut in a hob is much a matter of judgment but the following rule may be used.

To find the number of flutes in a hob multiply the diameter by three and divide the product by twice the pitch of the thread.

When the application of the above rule results in odd numbers of flutes take either the next larger or the next smaller even number.

The milling tool used in gashing the flutes should be about ⅛ or ¼ inch thick at the bottom of the gash and should be sunk into the blank about

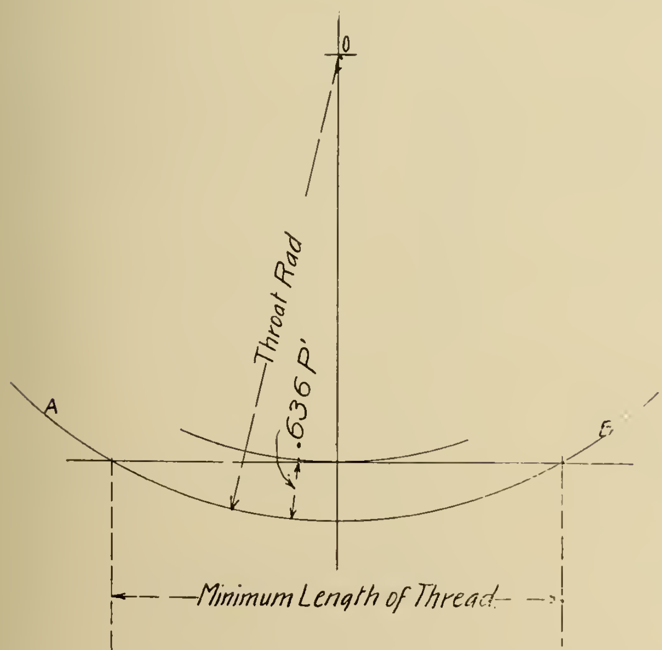


Fig. 5—Layout to Obtain Length of Worm Thread.

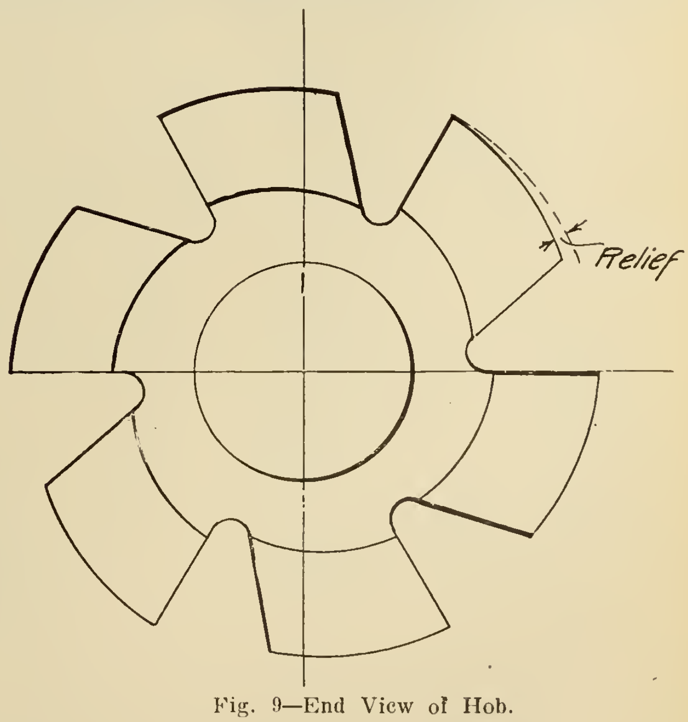


Fig. 9—End View of Hob.

strengthens the tooth and insures against cracking in hardening; and second, it rounds off the top of the gear tooth and gives it a workable shape. The filet is made equal to the clearance in the standard 29 degree involute system and is one-tenth the thickness of the tooth at the pitch line or .05xP'. The best argument for this style hob is the gear it produces in comparison with that of the ordinary hob. The diameter of the hob is made dependable both on the

The Making of the Hob.

In order that the correct shape of tooth may be obtained in the hob it is best practice to make a thread tool as shown in Fig. 8. It will be noticed that the point of the hob threading tool is wider than that of the threading tool for the worm shown in Fig. 6. This tool forms both filet and the round corners on the outside of the hob tooth, and also forms the tooth to the correct depth. The dimensions given in the figure are

3-16-inch below the bottom of the thread or space. The width of the gash at the periphery of the hob should be about two-fifths of the circumferential distance from one gash to the other. Fig. 9 shows how the hob should look from the end.

The teeth of the hob should be relieved by the eccentric method so that the face may be ground back in sharpening without changing the form. This is usually done on specially designed machines or

fixtures. Where such a machine or fixture is not available the teeth will have to be backed off by hand in a similar manner in which the teeth of a tap are relieved by the use of a file. The amount of relief that is necessary depends much on the method in which the hob is to be used in the process of hobbing. If the hob is to be used in a hobbing machine the relief may be more rank than when

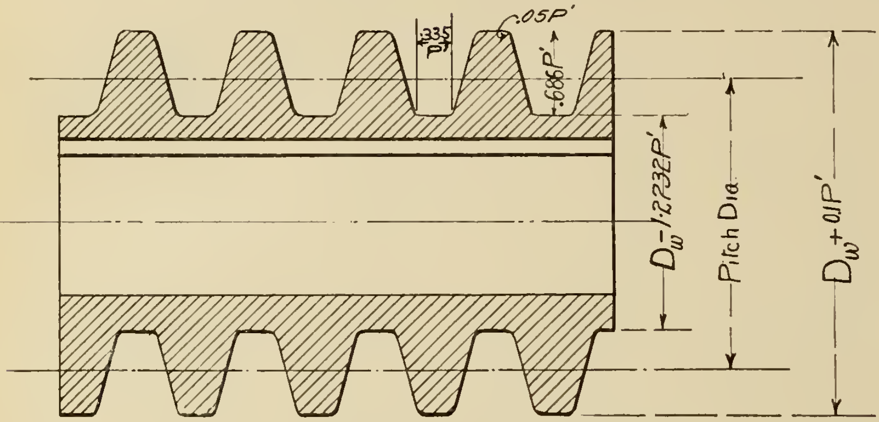


Fig. 7—Section Through Hob.

the teeth are to be hobbed in the milling machine. In the latter case, which will be explained later on, the hob is used to rotate the gear in the process, and it is evident that the bearing surface on the side of the teeth should not be too much reduced; whereas, in the regular hobbing machines the worm-gear is driven by outside means and rotates in unison with the hob.

In most cases it is better practice to gash the gear blank before beginning the hobbing process. This gashing is usually done on the universal milling machine. The following procedure is gone through. The blank is placed upon an arbor and swung between the centers of the dividing head, the arbor being dogged to the dividing head spindle. The gashing is done with an ordinary gear-cutter of a suitable pitch. The knee of the machine being raised and lowered for each gash, and the table of the machine being set at the angle of the thread.

Having gashed the blank all the way around the dog is removed from the arbor on which the blank is pressed and the arbor swung loosely between the centres, the table being in the meantime swung around at right angles with the axis of the spindle. The hob is placed on an arbor in place of the gashing cutter, and the knee raised until the proper centre distance is obtained while the hob is revolving. The proper depth of the being obtained, by degrees, raising the knee a small amount at each revolution of the gear. It is obvious that this method can only be used where the gear blank is gashed nearly to depth, the hob finishing up the tooth only.

In the regular hobbing machine the process is somewhat different, in that the gear blank is rotated by means of a master gear and worm, the hob being rotated at the proper velocity ratio irrespective of the centre distance. By this process it is possible to hob the teeth in the gear from the solid. The upward feed of the hob being automatic in this class of machines.

Lubricating Worm and Gear.

As mentioned in the beginning of the article the lubrication of the surfaces in contact is of great importance, as the lubricating agent serves to carry away heat. It is not sufficient that lubricant be applied intermittently since

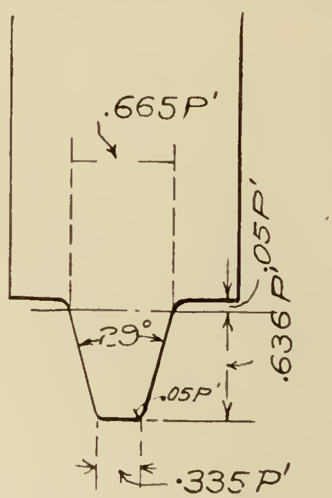


Fig. 8—Hob Thread Tool.

such a service is at best unreliable and unsteady. The supply must be constant, such as would come from having the worm run in an oil bath. The volume of lubricant should be sufficient so that it is kept at a low temperature and allowed to circulate as freely as possible. Better service would result from a source of lubricant under pressure, such as is used in lubricating the bearings in modern high speed engines.

Materials for the Worm and Gear.

There is a great difference of opinion as to the best materials to use in the worm and gear. Many successful drives have been constructed in which cast iron was used for both worm and gear. The most commonly found combination is that of the bronze worm gear and worm of steel. Many would not think of using any other than a hardened steel worm on a bronze gear. For ordinary purposes it is probably safer to use the steel worm and bronze gear, but many times the expensive bronze may be eliminated and the gear made of cast iron. This is especially so when good facilities are provided for lubrication.

After cast iron bearing surfaces, no matter for what use, have become glazed over and the lubrication not interrupted, the lasting qualities of such a bearing cannot be beaten. The only way of obtaining the glazed condition of the surfaces is by careful adjusting and care in running in.

In the ordinary system of spur gearing, gears having 30 teeth or less will interfere with the points of the teeth of the theoretical involute rack. As the worm is virtually a rack the same conditions must be looked for in its case, but since the hob, which is also a rack, forms the teeth of the gear there is no interference, but the sharp points of the teeth of the hob under-cut the teeth of the gear when the latter contains less than 30 teeth. It is best to use a gear in no case with less than 30 teeth but when the conditions of the problem make it impossible to get around it the following rule given by the Brown & Sharpe Co. should be used in dimensioning the blank instead of those given in Fig. 4: "Multiply the pitch diameter of the gear by 0.937 and add to the product 1.272 inches. The sum thus obtained will be the throat diameter of the blank."

Gears made to the above rule and containing less than 20 teeth should be hobbed only in regular hobbing machines.

A Right-hand Hob for Left-hand Gear.

There are many kinks to learn in making worm and worm gears. Among these we might mention that of making a right-hand hob answer for a left-hand gear. This trick is accomplished by swinging the table of the milling machine around to twice the angle of the thread in the hobbing operation. This brings the teeth at the proper angle for hobbing a wheel of the opposite hand. The bearing of the surfaces will not be so good when the teeth are hobbed by this makeshift, but when the angle is small the difference is slight and the knowledge of such a kink may pull one out of a tight hole at some time when such things count.

The Adaptation of the Profile Steels for Cutting Tools

Tools for Lathe, Planer, Shaper, Miller, Slotter, Etc., Made Without Forging, with a Saving in Weight of Steel and No Decrease in Strength.

By ALEXANDER GIBB *

Tool steel, rolled to special shapes, is becoming well known in Canada and is being more and more used for tools for the lathe, planer, shaper, slotter, and drilling machines, and for chisels, reamers, taps, bits, broaches, etc. These are known as profile steels.

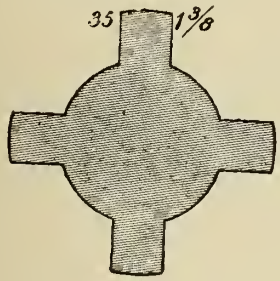


Fig. 1.—Star Profile.

These shapes allow a considerable saving in the tool steel account, because of the smaller amount of steel required in the making of any tool.

Since crucible steel was first used for tools very little progress has been made in the shape of the bars. The rolling mill has to some extent replaced the old tilt hammers, but the steel makers generally continue to roll their bars into the original shapes. Latterly, however, some of them have begun rolling bars of various shapes, and these shapes have received the name profile tool steels. J. Beardshaw & Son, Ltd., Sheffield, Eng., have placed two high-grade profile tool steels on the market. One is an air-hardened and the other a water-hardened steel. Some 250 different sizes of these steels are manufactured and these shapes require a minimum of labor in obtaining a finished tool.

In order to arrive at a successful result, two difficulties had to be overcome. The first was the making of the rolls capable of turning out the shapes,

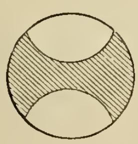


Fig. 2.—Twist Fluted.

and the second was to decide upon a limited number of profiles, sufficient to provide for all the tools necessary in machine shops, tool rooms and engineering establishments.

*Canadian agent for Beardshaw's Conqueror brand tool steel and drills, 13 St. John St., Montreal.

Special hard steel for tools is often damaged by inexperienced forging. This is entirely avoided by the use of profile steel, because nearly every tool can be made without forging the bars. The eliminating of forging, with its resulting inconveniences and of the costly milling for drills, etc., represents a great advance in the manufacture of tool steels.

To make a reamer 1¼ ins. diameter and 10 ins. long, either a piece 1¼ ins. round steel weighing 57 ozs., must be used, or a piece of star profile shown in Fig. 1, weighing 34 ozs. To make a twist drill 1⅜ ins. in diameter and 18 ins. long, either a piece of 1⅜ ins. round steel, weighing 117 ozs., must be used, or a piece of profile steel as in Fig. 2 with the same diameter, weighing 49

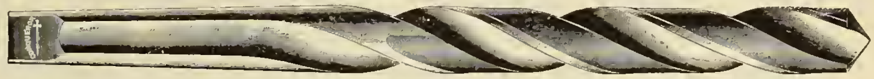


Fig. 3—Drill from New Profile Steel.

ozs. This profile is the latest addition and in Fig. 3 is shown a drill from this profile, which is being placed on the market. It is especially adapted for odd length drills and can be used as a straight shank drill or be turned to some standard taper, so that there is no extra expense in connection with the use of this drill profile. These two examples show a saving of from 45 to 55 per cent. over ordinary bars of the

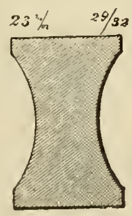


Fig. 4.—Fluted Profile.

same diameter and even if profile steel is slightly higher in price, it shows a considerable saving over a similar number of bars as this is the usual way it is purchased by the consumer.

The Star profile, Fig. 1, is rolled in 55 sizes. The average weight is 57 per cent. of that of round steel and 43 per cent. of square steel of the same outside dimensions. This is a style suitable for chisels of all kinds, reamers, lip drills, pinhole drills, counterbores, and in the large sizes for milling cutters.

The fluted profile, Fig. 4, is rolled in eighteen sizes and averages but 47 per cent. of the weight of round steel and 35 per cent. of the weight of sqdare steel of the same size. This section is specially designed for light lathe tools, brass work, planer and shaper tools. Fig. 5 shows this section made into a parting

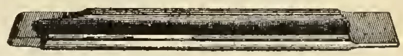


Fig. 5.—Parting and Roughing Tool Made From Fluted Section.

and roughing tool, combining lightness with the necessary strength.

Fig. 6 shows various sizes of the Vee profile. There are 24 sizes, the average weight being 32 per cent. of that of square steel of equal depth and 45 per cent. of the weight of round steel. In using this profile on English machine tools, blocks, such as that shown in our illustration, are made to fit the outline of the V and form a rigid fastening on the tool blocks. For American tool posts, this section is supplied with a flat bottom, so that the tool

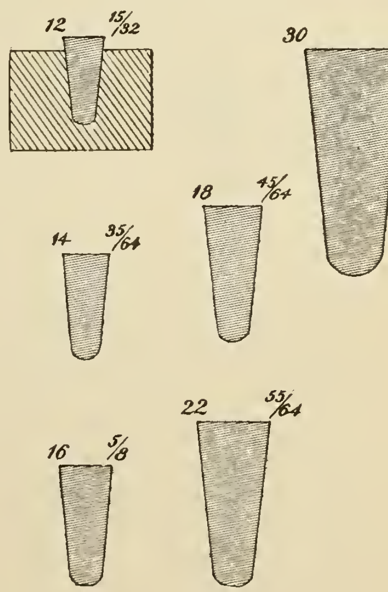


Fig. 6.—Vee Profile.

can be firmly clamped without the use of the Vee block.

The three-wing shape, Fig. 7, is rolled in 25 sizes and is suitable for small taps, roughing reamers and three-lipped

schucking drills. Fig. 8 is a bolt head section rolled in a variety of special shapes to conform to the ordinary types of bolt heads and intended for use on the rear of the turret lathe cross-slide. The scraper section, Fig. 9, rolled in

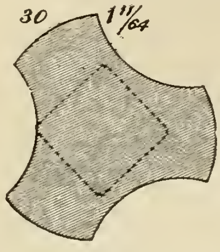


Fig. 7.—Three Wing.

three sizes, has three wings, and by grinding alone, is very quickly made into a tool which from its shape is very easy to use and very quick in its action. Fig. 10 is the parting section rolled in four sizes in depth and any width.

One of the difficulties in the manufacture of high speed steel, hitherto, has been the lack of uniformity in bars of the same brand, but the makers of the high speed steel used in these profiles use a revolving process of cooling and the ingredient, tungsten, a heavy alloy, cannot settle in the bottom of the mold. The surface of the profiles is much greater than ordinary shapes and it is therefore easier to obtain uniformity in annealing. The shapes rolled by Beardshaw are subjected to extensive tests before being placed on the market and any steel which does not come up to the standard specification finds its way back to the electric furnace.

Fig. 8.—Bolt Head.

The report, Fig. 11, shows the results of a test of four $\frac{3}{8}$ in. Conqueror brand fluted drills at the Sheffield Testing Works, Sheffield, Eng. These were subjected to a severe test and the table gives complete details of the test.

The Conqueror High Velocity steel, being of a different composition from other steels, requires different working. Heating must be done slowly with steel well soaked. The best results are obtained by forging at a yellow heat above a full bright red. Steel at this heat works quite easily. Forging at a low heat should be avoided as internal strains are caused by this and the steel is liable to be crushed.

To harden tools for planing and turning, heat the point of the tool slowly up to a full bright red, 950 to 1,000 degrees C, and bring up to a white heat just short of welding heat, 1,250 to 1,300 degrees C. Cool instantly in a strong cold blast. Steel cannot be spoiled if not soaked too long. Never attempt water hardening with high speed steel; the above method will assure success.

To harden drills, milling cutters and tools of intricate shape, heat the cut-

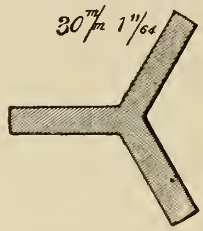


Fig. 9.—Scraper.

ting part slowly up to a full bright red, 950-1,000 degrees C. Bring turning tools rapidly up to white heat 1,250-1,300 degrees C, cool quickly in a cold blast till redness is just disappearing, quench off in a bath of whale oil or other suitable oil. A remarkable toughness, combined with great hardness, is the result of proper manipulation of this method.

The annealing of the Conqueror brand is simple in operation. It is accomplished by heating the steel slowly up to a red heat, 800 degrees C, and maintaining at this temperature,

Fig. 10.—Parting Tool.

the time depending on the size and thickness of the tools, and cooling down in some heat retaining material, such as lime, hot ashes, etc. A rapid method of annealing which gives good results on short pieces such as drill lengths, consists of heating up slowly to a dull red, maintaining there for a period of fifteen or twenty minutes, and quenching off in whale oil. Steel after this treatment can be machined easily.

The steel should always be ground on a wet emery wheel or wet grindstone, if possible, with a good supply of water running on the stone. Too much pressure must not be used as this causes surface cracks.

Test No.	Marks.	Revolutions per Minute.	No. of Holes Drilled.	Depth of Holes. Inches	Total Depth of Hole Cut Inches	Duration of Test. Min.	Duration of Test. Sec.	Depth of Hole Cut per Min. Inches	Feed Per Rev. Inches	Lubricant Used.	Condition of Cutting Edge on Drill After Test.	Material Operated Upon.
												STEEL BAR
												Analysis
4391U	1	435	10	2	20	3	5	6.5	.015	Soapy Water	Good	
4392U	2	435	10	2	20	3	5	6.5	.015	"	Good	Carbon — 0.42 p.c.
4393U	3	435	10	2	20	3	5	6.5	.015	"	Good	Silicon — 0.15 p.c.
4394U	4	435	10	2	20	3	5	6.5	.015	"	Good	Sulphur — 0.048 p.c.
4395U	5	435	10	2	20	3	5	6.5	.015	"	Good	Phosphorus — 0.062 p.c.
4396U	6	435	10	2	20	3	5	6.5	.015	"	Good	Manganese — 0.82 p.c.

Fig. 11—Results of Tests Made by Sheffield Testing Works.

QUESTIONS AND ANSWERS.

Tapping Cast Iron.

Ques.—To what depth should bolts or studs be tapped into cast iron?

Ans.—The depth to which bolts or studs are screwed into cast iron depends a great deal on the use to which parts thus screwed together are put. If there is a reciprocating motion the studs must be screwed into the cast iron to a depth of about three times the depth of the stud while if two pieces are bolted together permanently without motion a depth of one and one-half times the stud is sufficient. If the pieces remain stationary but the screws or studs must be removed frequently, the studs should be screwed into a depth of twice the diameter of the bolt or stud.

Weight of Cast and Wrought Iron.

Ques.—What is the weight of a cubic inch and a cubic foot of cast and wrought iron?

Ans.—The weight of iron varies greatly with the quality and if exactness is required it must be obtained by weighing. For ordinary work a fair average is used. The average weight of a cubic foot of cast iron is 450 pounds and for wrought iron is 480 pounds. For the weight per cubic inch divide these weights by 1728.

MACHINE SHOP METHODS AND DEVICES

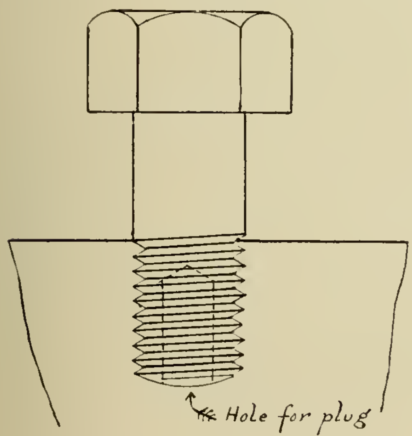
Unique Ways of Doing Things in the Machine Shop. Readers' Opinions Concerning Shop Practice. Data for Machinists. Contributions paid for.

HOW THE STUDS WERE EXPANDED.

By Frank E. Booth.

Some months ago I ran up against a snag while working on a certain job and succeeded in getting over the difficulty quite easily in the following manner.

We had some six castings which required two cap screws placed tightly in each of them. These cap screws were used as studs to support a bridge made out of a steel casting having slotted holes in it, so that it could be slipped under the heads of the cap screws. The function of this bridge was to hold a cast iron plug down on a ground seat in the main casting. These cap screws were ordered but when they arrived on



How the Studs Were Expanded.

the job the threads were found to be too easy in the already tapped holes, it being necessary that they be screwed tightly in place.

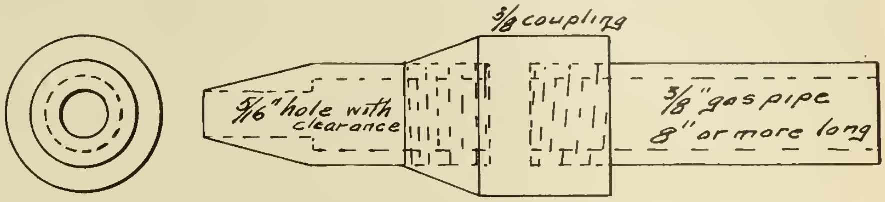
The cap screws were ⅜-inch in diameter, being plenty strong enough for the job. We drilled a hole with a 11-32-inch drill in the end of each cap screw, as shown in the sketch, and after heating the screws to a cherry red color we drove ⅜-inch cold rolled plugs into the drilled holes, thus expanding the stud and giving it a tight fit in the tapped hole.

TOOL TO MAKE DOWEL PINS.

By R. J. Russel.

The writer has found this to be a very useful little tool for making dowel pins which nearly all pattern makers have to buy or spend a lot of time making. The machine shop apprentice will make this tool in a half-hour; it saves me its price every week.

The sketch practically explains itself. Pick up a piece of straight-grained wood off the floor, and drive it through this



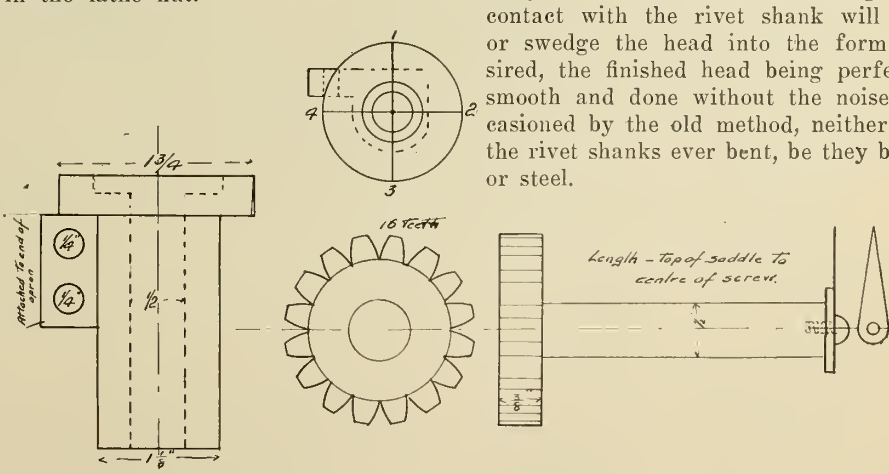
Tool to Make Dowel Pins.

with a mallet. It will drop out through the clearance hole a nice round, straight stick and nothing more to do with it than cut it the desired length.

THREAD-CUTTING ATTACHMENT.

By John T. Summer.

The accompanying sketch is of an attachment for the lathe for screw cutting, which saves the time taken in backing the lathe. The method of operation is to watch the pointer until it is opposite either 1, 2, 3 or 4, and then drop in the lathe nut.



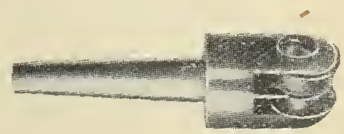
Thread Cutting Attachment.

NO MORE BOTCHED RIVETS.

By E. Crabtree.

Why? Because it is not necessary to hammer away your time and energy in the old-fashioned way, repeatedly striking blows with a hammer which disfigures the heads and often breaks them up. The most up-to-date machine for rivetting light rivets up to ⅜-inch is a "Rotary Rivetter," but in repair shops and similar concerns where there is not enough work to justify the outlay on such a machine, one can easily adapt the same principle with little expense, but with large results, besides its being a perfectly noiseless operation.

The accompanying illustration shows a taper spindle which has at one end twin rollers. Insert this tool in your



No More Botched Rivets.

drill press and run the same at a high speed and each roll revolving independently on its own axis when brought in contact with the rivet shank will roll or swedge the head into the form desired, the finished head being perfectly smooth and done without the noise occasioned by the old method, neither are the rivet shanks ever bent, be they brass or steel.

The time required to swedge a head on a rivet is but a second and gives a neat finished appearance.

These tools can be made in the tool room or purchased from the manufacturer of rivetting machines at a very small cost, and when once tried will be always used.

A SECTIONAL DIE.

By L. E. Salmon.

There are many and various ways of making and constructing dies used on power presses; but I think the accompanying sketch shows a very good way of constructing a large die of irregular shape. Its cheapness of construction and of material, the minimum cost to repair should the edge snip out or break, as well as the ease and convenience in hardening and tempering, all recommend it. There is little chance for change of shape through expansion or contraction and practically no risk of losing the die from breaking or cracking.

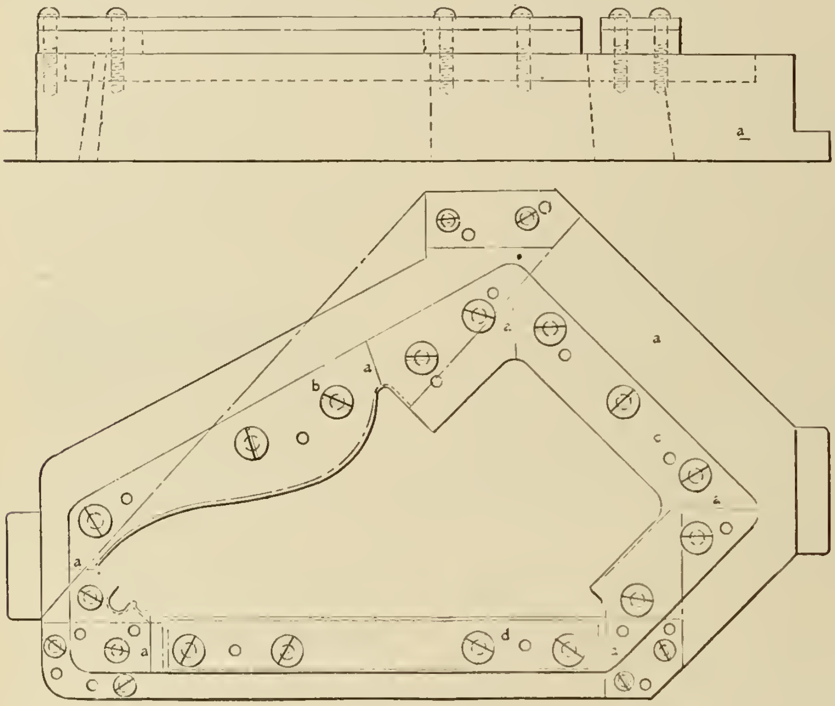
This die was made in a small shop with absolutely no facilities for hardening a die of this size if made in one piece, whereas by making it in sections, each piece was tempered with ease in an ordinary gas furnace. The body part A is made of cast-iron, the clearance hole being cast in it and about 1/8-inch left for finish to make a good square seat for the sections. This seating was done on the milling machine by using the vertical attachment, one chip was taken off the top to level it and two chips off the bottom.

The sections were all milled 1/2 inch thick and to shape as shown; the fine lines a a a a a a being the ends of each piece. The three pieces b, c, d were left 1-32 inch long until they were tempered and then ground to length. The screw holes and dowel-pin holes were drilled and counterbored (fillister-head screws being used and allowed to go 1-32 inch below surface) in the pieces but not in the casting until after all the pieces had been tempered and fitted, when they were all put in, fitting tight and then the casting was drilled through the sections for the screws and dowel pins.

It will be noticed that the retaining screws are placed well back from the cutting edge. This was done to overcome the effect of the strain on the edge and avoid any possible chance of developing a rocking motion and working loose.

The stripper is shown by the fine broken line. This is what is sometimes known as a "skeleton" stripper. This is often a very handy style to use and does its work very well for light stock.

The punch was simply a flat piece of tool steel worked to shape and sheared in as usual but left soft, it was held in the ram by means of a slide and an inverted die disk.



A SECTIONAL DIE

This die was to cut blanks out of 0.025 inch semi-hard steel 7 inches wide and worked well.—American Machinist.

LUBRICANTS USED WHEN MACHINING VARIOUS MATERIALS.

By S. J. Kelley.

Cast iron is usually worked dry as in olden times, but I have found that when hard cast iron gears are to be cut, say, with three cutters, the first cut through will work better with strong soda water. Of course, it makes an objectionable mess, but the work will be done faster and the cutters keep sharper longer than with the dry process of cutting.

Brass and babbitt are usually cut dry, but to hand-ream brass and babbit is sometimes a difficult task if the reamer is a little dull. Coal oil and turpentine are used with good results and one man can do the work of two with ease. Cast iron can be hand reamed easily with tallow and graphite, mixed, and the whole will be kept just the size of the reamer. Copper can be worked well with lard oil and turpentine mixed.

In boring babbitt bushings and rod boxes in a lathe or boring mill, it is very difficult to work the material dry as the chips have a great tendency to roll around the tool and into a hard ball, thus tearing the metal and making a rough, ragged hole. In this case coal oil and lard oil mixed will work well.

Cheap oil is sometimes used as a lubricant for cutting, but soap water or soda water is better for iron and steel shafting and with a sharp tool and light finish cut the work will be smooth enough to polish without filing.

Rawhide is a very peculiar substance to work, and to drill it with a twist drill is a tedious job, as the flutes will clog and stick if run dry. I have seen a lot of drills broken in this manner. A cake of soap held against the drill will prevent all trouble and sticking of drills. It is bad practice to use oil on rawhide as it injures the fibre and loosens the glue. Drills should be run at very high speed in rawhide to work well.

Turpentine is good in some cases where fitting is done. such as scraping lay-out plates, or face plates. Oil will form a coating so that marks cannot be seen plainly, but turpentine will prove beneficial on this kind of work if used freely. The marks can be seen plainly, and the work is a great deal easier to scrape than with an oil surface, as the oil glazes over the surface and makes it hard to start a tool.—American Machinist.

COMBINED CRUCIBLE STEEL AND IRON.

By Wm. Abbott.*

. This combination of steel and iron can be adapted to numerous purposes, especially as the steel portion can be supplied in any desired temper from the mildest shear temper to the hardest tool temper and welded satisfactorily in either case. Another advantageous feature is that the steel can be laid on in any desired position and thickness. It is principally used for machine knives of every description, shear blades, wood working tools, soft plates, plow plates and has been adopted in some shops for die blocks where the wear is very great.

* 334 St. James Street, Montreal, agent for Jones & Colver, Sheffield.

DEVELOPMENTS IN MACHINERY

New Machinery for Machine Shop, Foundry, Pattern Shop, Planing Mill; New Engines, Boilers, Electrical Machinery, Transmission Devices.

SPECIAL MULTIPLE DRILLING MACHINES.

The machines illustrated in Figures 1 and 2 were designed and built especially for drilling the new structural steel, called "Bethlehem section," manufactured by the Bethlehem Steel Company, under the grey process.

In Fig. 1 is shown the double head horizontal machine, which is made in two sizes. One size carries 12 in. x 48 in. heads, that is, the adjustable drill spindles cover any layout within a 12 in. x 48 in. rectangle. These heads are equipped with 18 drill spindles each. The other size carries head 12 in. x 24 in., with 10 spindles to each head. Both heads on the horizontal machine are operated independently or together at the will of the operator.

The single head vertical machines shown in Fig. 2, are also built in two sizes, one carrying 16 drill spindles on a working rectangle of 12 in. x 36 in., and the other carrying 10 drill spindles on a working rectangle of 12 in. x 24 in.

All spindles have No. 3 Morse taper and are designed for drilling 1 in. holes in soft steel, at a speed of 55 ft. per minute on the periphery of the drill, with ranges of feed up to .01 of an inch per revolution of the spindle.

Each head is equipped with an oil pump, pan reservoir and connections to each spindle, to allow of oiling each drill independently; also with a two-speed quick return of the drills.

The double head horizontal machines are for drilling flanges and the vertical are for drilling the web. This allows the necessary drilling with the minimum handling of the work. In the case of the double head horizontal machines, each head sustains the drilling pressure of its opposite. In both style of machines, each head is independently driven by a variable speed motor, and in case of the movable machines, an extra motor is required for that purpose. The 18 spindle heads are driven by 25 h.p. motors, the 16 spindle head by 20 h.p. motors and the 10 spindle heads by 15 h.p. motors.

The vertical machines weigh about 11,000 lbs. and the double head horizontals about 25,000 lbs., without motors.

These machines were designed and built by the Baush Machine Tool Company, Springfield, Massachusetts.

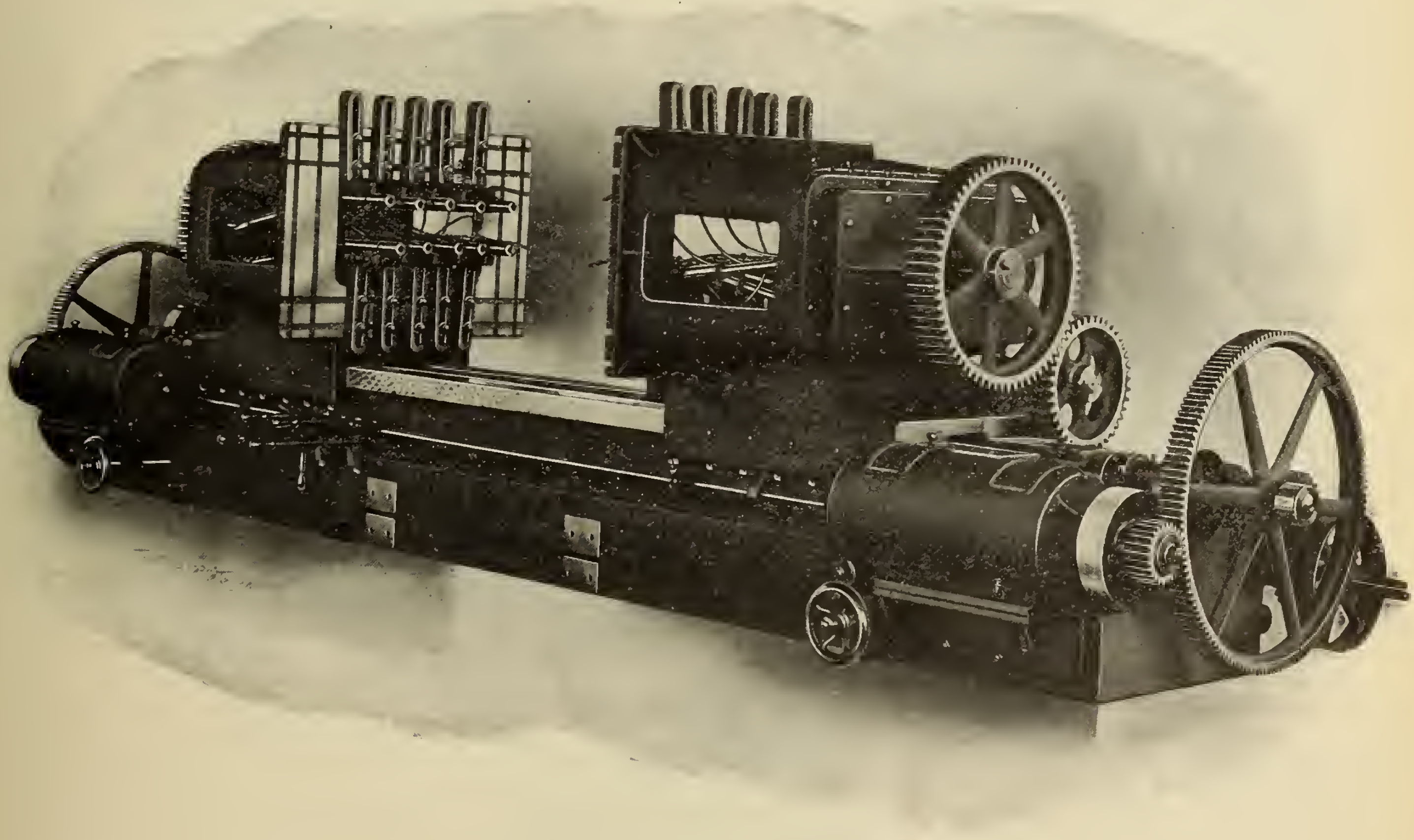


Fig. 1—Special Multiple Drilling Machines.

PRESS FITTED WITH STAGGER FEED.

In the accompanying illustration is shown a Bliss press fitted with patented stagger feed device recently designed and built by the E. W. Bliss Co., 20 Adams Street, Brooklyn, N.Y. The attachment can be made adjustable for the different size blanks, and while specially adapted for round work, can be used to a decided advantage on irregular shapes.

The simplicity of the attachment is one of its points of merit, overcoming the objections which are sometimes brought forward against automatic stagger feed gang presses. With the attachment no preparatory slitting of

sheets is necessary. This will be seen from a description of the operation of the machine, which is as follows :

The sheet from which the blanks are to be cut and formed is placed on the table and fed against the first finger which together with the back gauge on table, registers the sheet for the first cut, after which the press is run continuously, tension being kept on the sheet to bring it against the first finger which acts in a manner similar to the regular automatic finger gauge. As the sheet progresses the scrap is sheared from the back by means of knives which cut a true and straight edge for gauging the back of sheet on the second run, for the starting of which run the stagger finger is brought into play by depressing a lever underneath the table. The sheet is again placed against the back gauge and brought up to the stagger finger mentioned. After the first cut, the stagger finger is automatically disengaged and the first finger again comes into play. The sheet is run through until entirely cut up in the manner described, the stagger finger being used alternately to start every other row of blanks. By using this stagger method of cutting the makers claim that a saving of 6 per cent. to 15 per cent. in the amount of stock is effected, this varying according to the size of the blank.

We will here give several illustrations showing the saving effected : Take a sheet of tin 20 in. x 28 in., from which you wish to cut blanks requiring a $2\frac{3}{4}$ in. diameter cut edge. By the old method of slitting the sheet into strips and then running through the press, you would obtain 70 blanks from the sheet. By the stagger method used in the press shown, 76 blanks are obtained from the same size sheet. Another illustration is shown in the manufacture of bottle caps for which $1\frac{1}{4}$ in. cut edge is necessary. By the old method, from a sheet 20 in. x 28 in., 234 blanks are produced; by the method used in the press shown 270 blanks are obtained from the same size sheet. These we think, are very good illustrations of the advantages of the machine.

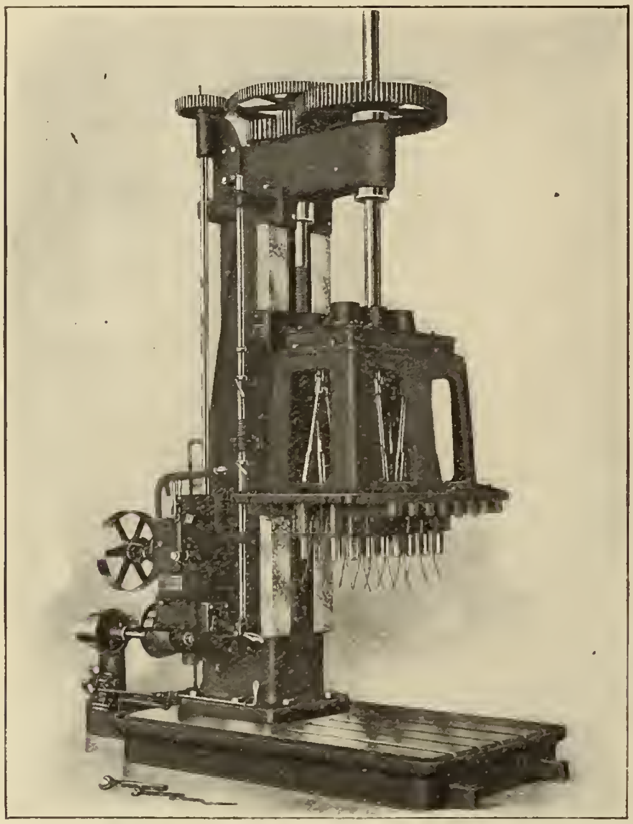
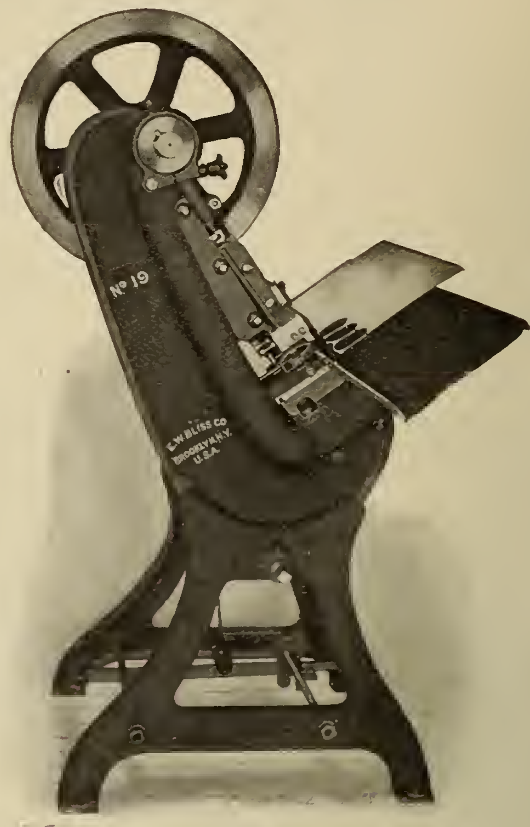


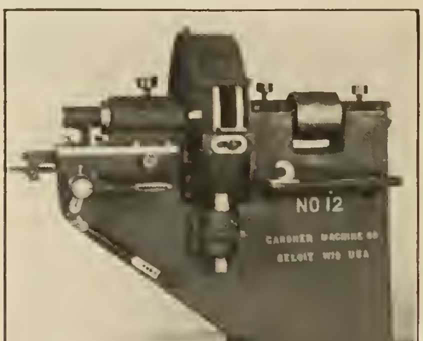
Fig. 2—Special Multiple Drilling Machines.



Press Fitted with Stagger Feed.

IMPROVED DISC GRINDER.

The accompanying half-tone illustrates a new feature in disc grinders. This machine has been brought out by the Gardner Machine Co., Beloit, Wis. It is designed for rapid machining of small pieces having parallel faces to be finished, such as bolt heads, square or hexagon nuts, wrenches, thrust collars, die blanks, reamer blades and thread die chasers, also typewriter, sewing machine, firearm parts, etc.



Improved Disc Grinder.

The chief feature of this machine is its one belt drive, the left-hand disc wheel being mounted on a hollow spindle supported in the sliding head. A driving shaft coupled to the spindle carrying the right-hand disc wheel and driving pulley, drives the hollow spindle carrying the left-hand disc wheel. The drive shaft is splined to engage a key fastened in the hollow spindle, and is provided with dust-proof collars to exclude dust from the hollow spindle, 1.

To remove the disc wheels from the machine it is only necessary to uncouple the driving shaft of the left-hand head, from the main spindle of the machine. The end of the drive shaft is made with a left-hand thread and taper seat, and the main spindle of the machine is bored and threaded to suit

same. The sliding head may be removed and special work table or fixtures used in connection with single wheel.

The disc wheels are fastened to spindles by the usual countersunk screws.

The sliding head is operated by means of a hand lever, which is directly connected to a steel cut pinion operating in a steel cut rack fastened to the under side of sliding head.

The sliding head is equipped with micrometer stop screws and back stop. The back stop is a very important feature in double disc grinding—especially where thin work, say from 1-8 inch down to 1-32 inch in thickness, is being ground. By means of this back stop, the backward travel of the sliding head is confined to the least possible amount required to place the piece to be ground between the wheels, and thus removes the liability of the work being caught between the wheels and the work rest.

The maximum distance between wheels is 4¼ inches, which in a great majority of cases is ample. This space may be increased to suit special cases.

The machine throughout is rigidly constructed and great care has been taken in providing perfect lubrication for, and the exclusion of dust from, all wearing surfaces. Disc wheels either 15 or 18 inches diameter may be used. Weight of machine as shown is 1,050 pounds.

INTERESTING MILLING MACHINE OPERATIONS.

The accompanying illustrations show two very interesting milling machine operations, made possible on the standard milling machine through an improved circular milling attachment just produced by the Kempsmith Manufacturing Company, Milwaukee, Wis. Figure 1 shows the attachment used in milling the faces of 12-inch pulleys. The rough pulley is mounted firmly on the attachment, and through the power feed, is revolved against the inserted tooth milling cutter screwed on the spindle. The table is adjusted slightly off-centre longitudinally, which results in a convex cut, thus providing for the desired crown on the pulley face. It is not claimed that the milling machine in this job is the equal of a special or automatic machine designed for this purpose ; the main advantage is that, in addition to the wide range of work possible on the standard miller, the use of this attachment accomplishes satisfactorily and almost automatically, this character of work which would otherwise require a more specialized and more expensive equipment. The extent of the cut and the consequent strain involved give an idea of the rigidity of the attachment.

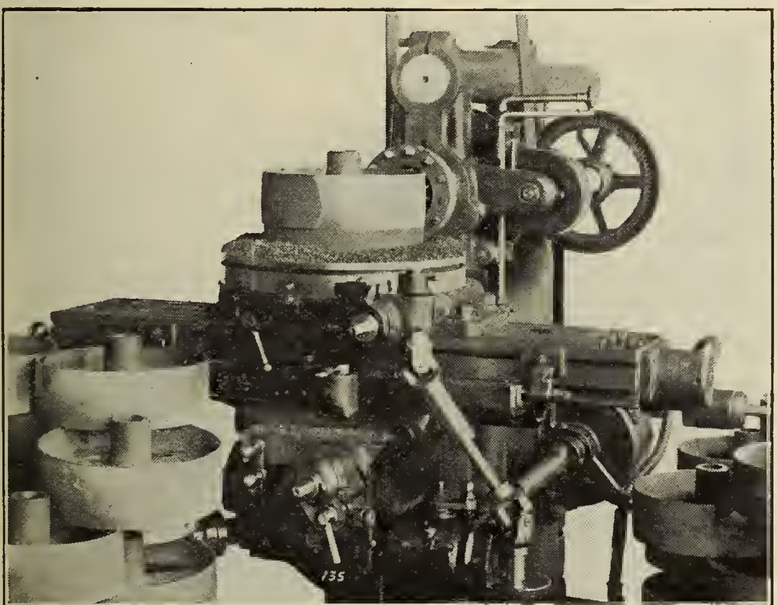


Fig. 1—Interesting Milling Machine Operation.

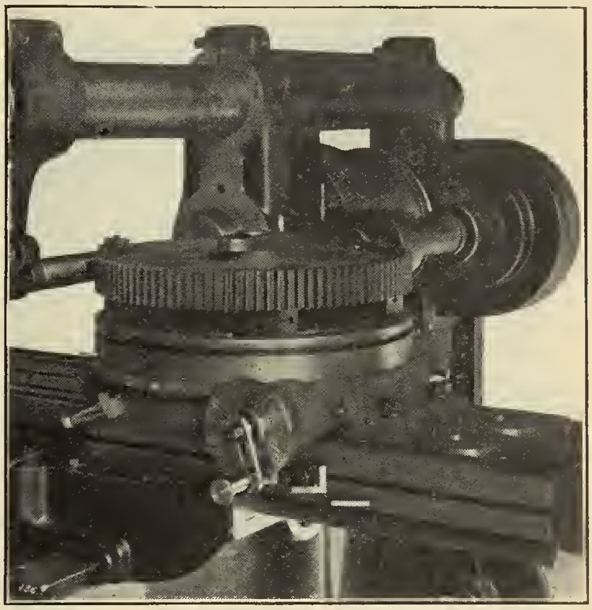


Fig. 2—Interesting Milling Machine Operation.

Figure 2 shows the attachment employed in cutting a gear, 6 pitch, 18 inches diameter, which is far too large to swing in the dividing head. It is mounted horizontally on the attachment, and the power vertical feed on the miller is used in cutting the teeth. The worm shaft of the attachment is arranged to readily receive the index plate mechanism, as regularly furnished with dividing heads, and since the ratio of worm and worm wheel is the same as on the dividing head, the full range of divisions is obtainable. The very large diameter of the worm wheel insures the highest accuracy. This makes the circular attachment in effect a dividing head, especially valuable in cutting large diameter gears, which could not be handled easily in any other manner without the use of a specialized machine. Either of these jobs is such as might be encountered in any general repair or jobbing shop.

The attachment is built in two sizes, with 14-inch and 18-inch tables. The table has a solid bearing for almost its whole extent on the attachment base, and is clamped at any angle through 360 degrees, through the same patent ring clamping mechanism as is used on the universal millers. Table can be released from worm wheel for quick revolving.

NEW HIGH SPEED RADIAL DRILL.

The accompanying illustration is one of a new line of high speed radial drills which the American Tool Works Co., Cincinnati, have brought out to take advantage of the productive power of the high speed twist drills.

Special attention has been given to the efficient lubricating of this machine.

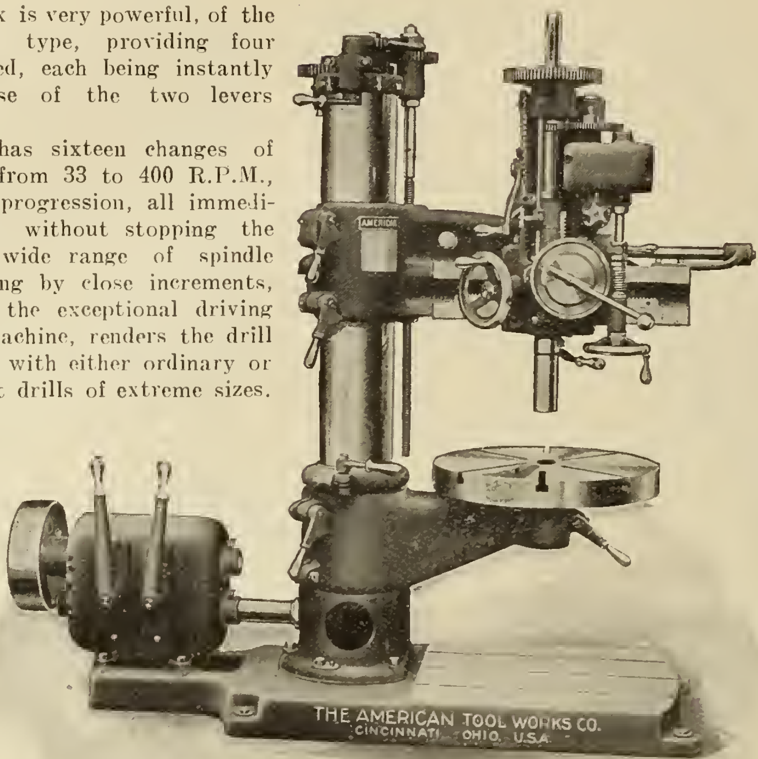
The feeding mechanism on the head provides four distinct rates of feed, covering a carefully chosen range, in geometrical progression, from .007 in. to .020 in. These feeds are all readily obtained by the simple turning of the knob on feed box until the desired feed shown on dial comes opposite a fixed pointer. The all-gear feeds, when supplied instead of belted feeds, insure vastly increased productive capacity, rapidity of change and positive action. Feeds operate through a friction which permits a drill being crowded to its limit without strain to the feed works.

Feeds can be automatically tripped at any position of spindle by adjustable trip dog and pointer, acting on the worm clutch. Depth graduations are on

the spindle, and all depths can be read from zero. Safety stop acts automatically at full depth of spindle, preventing breakage of feed mechanism.

The speed box is very powerful, of the geared friction type, providing four changes of speed, each being instantly available by use of the two levers shown.

The spindle has sixteen changes of speed, ranging from 33 to 400 R.P.M., in geometrical progression, all immediately available without stopping the machine. This wide range of spindle speeds, advancing by close increments, combined with the exceptional driving power of the machine, renders the drill equally efficient with either ordinary or high speed twist drills of extreme sizes.



New High-Speed Radial Drill.

Engraved speed plate enables the operator to select the proper speeds for both carbon and high speed drills, also for boring and tapping. Spindle is counterbalanced and has frictional quick advance and return.

The column is of the double tubular type. The arm is of parabolic beam and tube section. The head is moved rapidly along the arm by handwheel through rack and spiral rack pinion.

The tapping mechanism is carried on the head, between the back gears and speed box, thus giving to the frictions, already very powerful, the benefit of the back gear ratio, making unusually heavy tapping operations possible, and also permitting taps to be backed out at an accelerated speed. The lever for starting, stopping, or reversing the spindle, is controlled at the head from the front of the machine.

A REMARKABLE BROACHING MACHINE.

We show in the accompanying halftones a Lapointe broaching machine provided with special cutting tools, and engaged on what is, without much doubt, the heaviest broaching operation ever undertaken. The size of the hole to be broached is approximately 8 inches square though the hole is not really square, being of the special shape shown in Fig. 2. Not only is the work remarkable on account of its size, but also in the fact that the surfaces had to be broached on a taper, the outer end of the hole being ½-inch further across than at the bottom, while the work is rendered still more difficult from the fact that the opening is closed at the small end. Thus the only way of broaching is to commence at the bottom and work outward. A recess of 3 inches long and about ¼-inch deep is furnished at the bottom, however, to allow the starting of the broach. the stock to be removed on each of the finished surfaces of the work is

Fig. 2.—The Hole Which is to be Broached.

about 1-16 inch thick; the total area to be broached is 14 inches long, with a developed width of 24 inches. In the centre of each face of the hole, it will be noticed that there is a half-round recess ; no broaching is done in this part. This piece of work is a steel casting.

The machine used is the largest of the line of broaching machines made by the builder, the Lapointe Machine Tool Co., of Hudson, Mass. The construction of these machines has been prev-

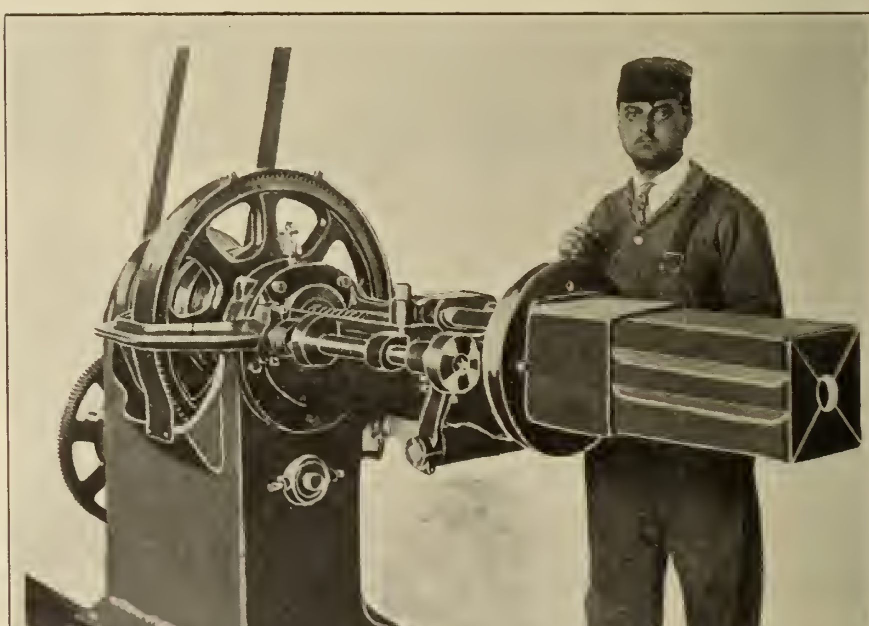


Fig. 1.—The Machine With the Work in Place.

iously described in Canadian Machinery.

The mechanism consists primarily of a threaded draw bar or ram, operated by a revolving nut driven by suitable gearing and reversing mechanism, this mechanism being operated by dogs and adjustable stops to give the required length of operating and return strokes. Practically the only special feature of the equipment is the special broaching head and broaches used. These are of such unusual size and ingenious construction as to be of decided interest.

The construction of the broaching head is perhaps most plainly shown in Fig. 3. It consists essentially of a central square mandrel, tapered to the taper of the hole to be finished in the work, and provided with ways in which slide four separate broaches, one for each corner of the work. These broaches are connected with the head of the ram of the machine by bars, which are milled down to such a thinness as to have sufficient flexibility to permit the broaches to spread apart as they approach the inner end of the stroke, and come together again as they return to the starting position on the outer end of the mandrel. Each of the broaches is made of a solid piece of tool steel, with a series of 13 teeth of suitable shape milled in it.

In operation the ram is first extended to the outer limit of its stroke, with the broaches at the outer and smaller end of the square central mandrel. The work is then placed over the mandrel as shown in Fig. 1, in which position the broaches nearly touch the closed bottom of the hole. The outer teeth in this position are in the recess. The machine is then started up, and the revolving nut, and threaded ram pull the broaches up on the tapered guides of the square mandrel, by means of the flexible pulling rods. As the broaches are thus drawn inward on a gradually expanding form they cut the required shape in the interior of the steel casting. The broaches first are tapered, so that the outer end is 1-32 inch larger than the end to which the pulling rods are connected, this being the amount which is to be removed from the work in each operation.

As is shown in the engraving, a special abutment or base is provided for taking the thrust of the work as it resists the action of the cutters. Piled up on this special base, in Fig. 3, will be seen the chips produced at one stroke of the machine. It will be noted from their character that a cutting action of the most desirable kind is effected by the broaching blades, indicating that the work is done in a very superior way. The approximate pulling strain on the four rods operating the broaches is estimated by the builders to be from 75 to 100 tons.

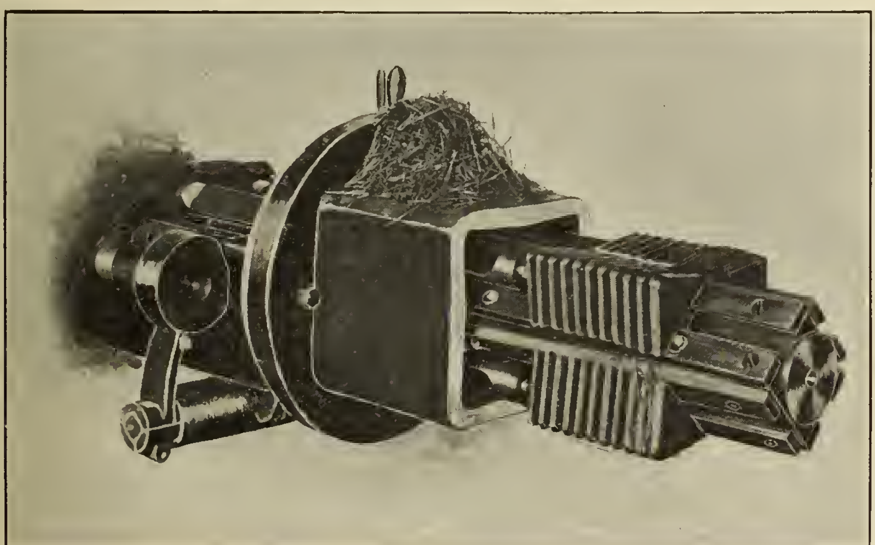


Fig. 3.—The Taper Broach and the Chips it Produces. Note Flexible Pulling Rods.

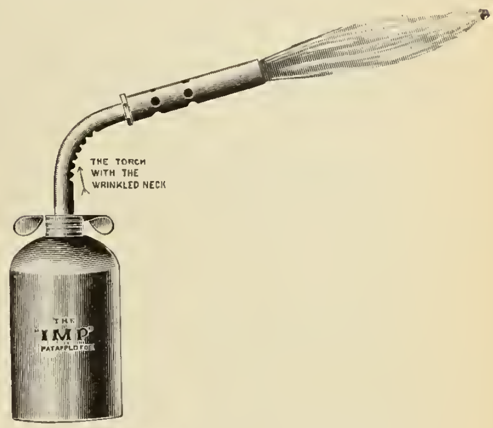
A POWERFUL GASOLENE BLOW TORCH.

The "Imp" Torch, shown in the accompanying illustration, is a patented device which will, it is claimed, do as much work as most of the larger torches, with the advantage of compactness, simplicity and cheapness.

This device is made entirely of brass metal, highly nickle-plated, the size of the tank is 1¾ inches in diameter by 3½ inches high while the height of the whole torch is only 6¾ inches.

It is entirely automatic in operation, has no pumps or valve, needs no tolls, starts with a match and gives a perfectly clean, powerful Bunsen flame for over two hours on four ounces of gasolene.

The corrugated neck increases the heating surface to such an extent that the flame of a match easily generates gas enough for starting, after which



Powerful Gasolene Blow Torch.

the perfectly designed mixing-tube renders further attention unnecessary.

The Frank Mossberg Co., of Attleboro, Mass., are the manufacturers of this torch.

WORK TO ACCOMPLISH.

If a man works for a living—that's all he gets. The fellow who reaps the prizes is the fellow who enjoys his work and is sorry when it's time to quit.

For after all there is no pleasure that quite equals the pleasure that comes with the knowledge of accomplishment.

Ever hear of Bill Jones, the superintendent of the Homestead Mills of the Carnegie Company? No?

Well, Bill Jones set out to make his mill the best in the world. He put so much enthusiasm into the men under him that time and time again a record was broken.

What do you suppose was the prize? A new broom—that's all. The crew holding the record could hold the broom—just an ordinary corn-straw broom like the one to be found in every house.

Bill Jones made $25,000 a year and gave it all away, helping the families of the men under him.

Jones made $25,000 a year because he loved his work—he didn't work for the $25,000, but for the joy of working.

And he was able to impart something of that same joy into the men under him.

Yes—there's a heap of fun in working hard when your heart is in your work.—Silent partner.

One of the nice things about being the boss is the privilege of working nights and Sundays.

POWER GENERATION AND APPLICATION

For Manufacturers. Cost and Efficiency Articles Rather Than Technical.
Steam Power Plants ; Hydro Electric Development ; Producer Gas, Etc.

NEW POWER EQUIPMENT OF THE GALT, PRESTON & HESPELER RAILWAY.

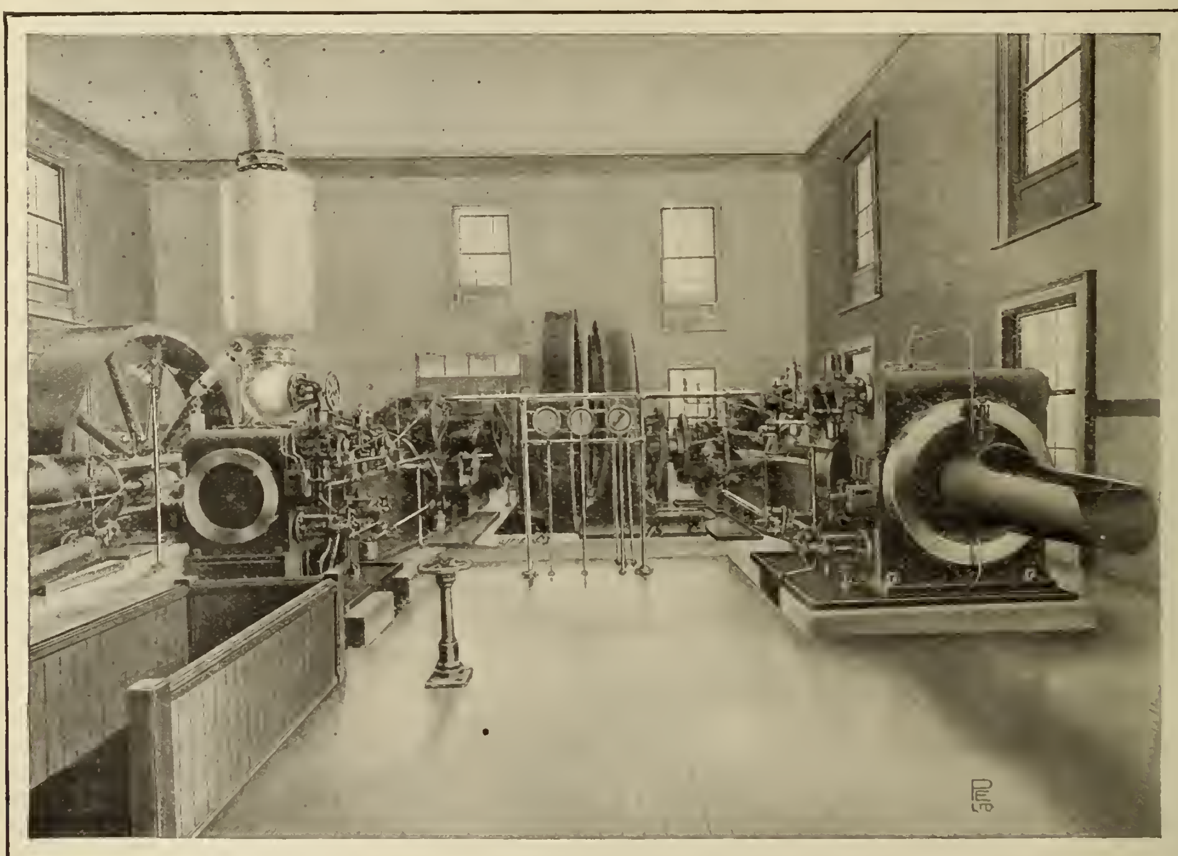
Very radical improvements have been made in the power plant and rolling stock equipment of the Galt, Preston and Hespeler Railway, with the result that it is now probably the best electric line in Canada.

From the standpoint of the public, the most important improvement is the equipping of the road with modern and commodious cars and the building of the new station at Hespeler. These cars were built by the Ottawa Car Co. and are heavy, well furnished cars with enclosed arc lamps for lighting.

The cars are equipped with D.C. 500 volt, Westinghouse motors, and each car, including freight cars, is equipped with the Westinghouse unit switch control system, so that the cars can be operated in trains for the handling of large crowds. Another reason for this equipment was to have the main controller under the car, thus saving space in the motorman's cabin. The master controller and the air brake control occupy but little space. The motorman's cabin can thus be small.

The air brake system is standard Westinghouse straight air equipment for single cars, and regular train equipment for trains of cars.

Last year an addition was made to the power house equipment in the form of a cross compound Goldie Corliss engine, built by the Goldie & McCulloch Co., Ltd., Galt, direct connected to a 500 k.w., 25 cycle, 380 volt, Westinghouse alternator, shown in the illustration.



New Power Equipment of Galt, Preston & Hespeler Ry.

The engine has cylinders 20 and 40 inches in diameter and 36 inches stroke and runs at a speed of 125 revs. per minute. The rated capacity of the engine is 750 I.H.P., with a maximum overload capacity of 60 per cent. above the rated load. The valve mechanism is the Goldie & McCulloch type for high speeds with steam actuated dash pots and double eccentric motion. This latter arrangement allows a long range of cut-off and consequent high overload capacity. The engine frames are of the heavy duty type, and are cast in one piece and rest on the foundation for the entire length. The main bearings are 15 inches in diameter by 27 inches long, and the flywheel is 14 feet in diameter and weighs 32,000 pounds. These flywheels are of sufficient capacity to enable the 25-cycle generator to be run in parallel.

The ease with which the generators on this type of engine are paralleled is due in a great measure to the governor employed. This governor is of the Rites Inertia type and is especially designed for this service.

The pulley for driving the belted exciter is also mounted on the engine shaft.

As a reserve, a heavy duty Wheelock engine, part of the former equipment, has been retained. This engine is belted to a Westinghouse 600 volt D.C. generator.

Power is fed to the trolley line at 600 volts D.C., from a 225 k.w. West-

inghouse rotary converter, which takes current direct from the alternator. A second rotary converter of the same capacity is now being installed in the power house.

At Berlin there is a storage battery to take the peak loads. This storage battery building was remodelled last summer and a 225 k.w. rotary converter installed.

To save transmission losses a 6,600 volt transmission line has been installed between the power house at Preston, and the storage battery building at Berlin. Westinghouse transformers have been installed in the power house to step up from the 380 volts from the machine to the 6,600 volts of the line. Step down transformers are installed in the storage battery building to step down again to the 380 volts for the rotary converter which feeds to the trolley line at 600 volts D.C.

It is expected that further additions will be made to the storage battery capacity.

In case power is purchased from the Hydro-Electric Power Commission, it will have to be bought by peak load, and in that case another storage battery will be installed in Preston to cut down the peak load still further.

The power plant will then be maintained as a reserve.

Great Saving in Oil Effected by Use of a Filler

One Barrel of Oil per Year, or One Gallon per Week, Used on Ball Engine, Generating 400 H.P.—How it Was Done.

By GEORGE H. KELLOGG.

The remark of an oil agent, that I "ought to be ashamed to look an oil agent in the face," when I told him that I only used one barrel of engine oil per year on a cross-compound Ball engine developing 400 horsepower, caused me to think that others might be interested to know how I accomplished the feat.

The engine is practically inclosed and has sight-feed spindles for all bearings, supplied by a pipe-oiling system connected to an elevated tank. All drips, except for the eccentric shields and the idler-arm drip, lead to the crank-case, from which the piping extends under the floor to a filter. This filter is one of my own "get up;" it is not patented as far as I know. After being filtered continuously for from six to eight months, the oil comes out perfectly clear, only slightly darker in color.

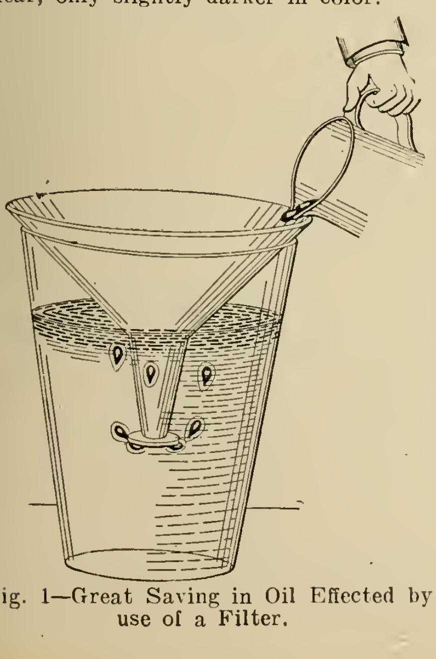


Fig. 1—Great Saving in Oil Effected by use of a Filter.

I had previously made three filters, of the "oil through hot water" variety, for other plants in which I had been employed, and was intending to make

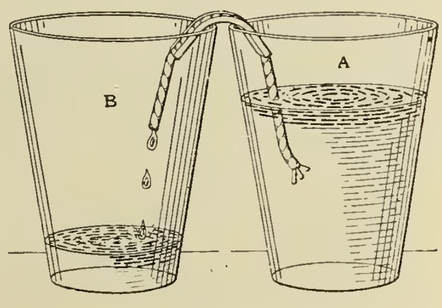


Fig. 2.

or get one of the same kind when I took charge of this plant. But at lodge meeting one night I got into an argument with an oil expert regarding the efficiency of filters in general, and the "oil through water" kind in particular. One of his remarks impressed me very much. It was: "Oil manufacturers will water their stock, but they keep the water away from the oil. He also told me that oil exposed to moist atmosphere would absorb from 2 to 3 per cent. of moisture, and that the muddy and turbid appearance of oil coming from the ordinary filter was caused by the moisture it contained. By putting the oil up through a filter bed of charcoal, or other absorbing material, the oil would leave the water behind and come out clear again. Oil manufacturers use a filter bed to take the dirt out of oil, but water, no matter how hot, will not take the dirt out.

The next morning I started to experiment. I took a small funnel and soldered a small tin cap to the lower end, to spread the oil out in drops. Then I filled a large tumbler half full of hot water and placed it on the steam chest

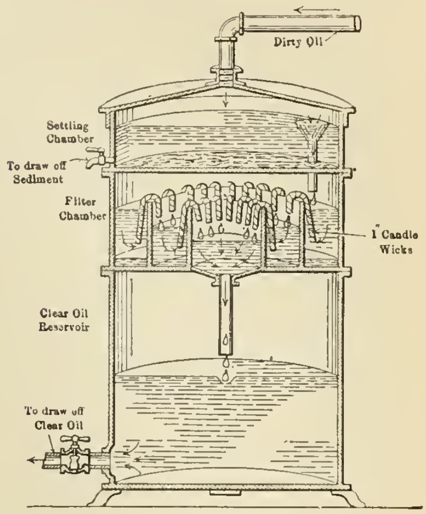


Fig. 3.

to keep it hot. I put the funnel in so the tin cap was 2 inches under the water (Fig. 1) and then put in the dirty oil very slowly. As each drop of oil formed on the upper edge of the cap, to flow through the water, I watched to see it leave some of the dirt behind, but it didn't. After putting through enough to nearly fill the glass, the water was just as clear as when I started. I then put some fine iron filings in the oil, and the film of oil around the filings carried them up through the water, too. That settled me on the "oil through water" proposition.

Then I got another glass and making a tin trough to reach from the inside of one glass over into the other, I put a lampwick in the trough (Fig. 2). Then putting the dirty oil in the glass A, I watched results. Soon drops of clean oil formed on the end of the wick in the glass B, and in about four hours I had half a glass of as clean oil as anyone ever saw.

Having found a method that produced good results, I worked it out on a large scale. I had a galvanized tank made, 20 inches high by 30 inches diameter, for a clean-oil tank; another of the same diameter and 12 inches high, with the lower rim flanged to set on top of the clean-oil tank, for a filtering chamber; then on top of that another tank 6 inches high, with a flanged rim to set on the filtering chamber, with a cover, through which a pipe leads the dirty oil. This is a settling chamber, where the oil separates from most of the water and heavy sediment. See Fig. 3.

From the settling chamber the oil is fed to the filter chamber by an automatic valve, then through 9 feet of 1-inch wicking. By this means the oil is separated from the rest of its impurities and is carried up over partitions

of troughs, draining into the clean-oil tank. This filter will take care of one gallon of oil per hour, and so I use about that much oil, although half that amount would be ample for the engine. The extra oil washes off the bearings and keeps them cool, and I am only wearing out and losing about one gallon per week.

I find that I cannot use a cheap paraffin oil, nor an oil of high viscocity, as the wicks soon separate the filler or heavy compounding from the mineral stock, leaving a thin oil of poor lubricating quality. I have tried four different oils in my system and always put the oil in on three months' trial; if it will run three months, filtering continuously, I would risk it the other nine.

In putting an oil on trial, I put the whole barrel in the system, and after it has worn down to about 25 gallons I put in a gallon of fresh oil each week to maintain the level.—Power and the Engineer.

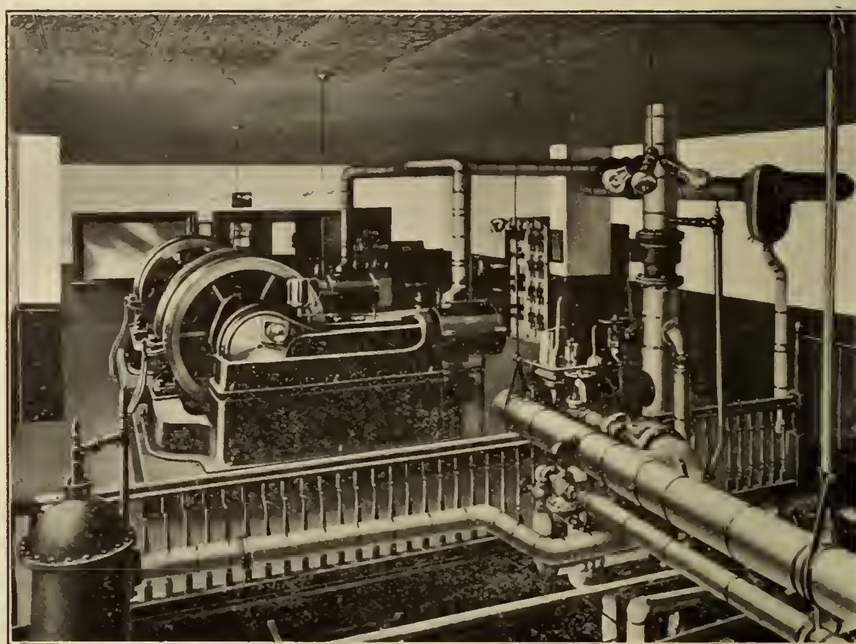
A MODEL HOTEL PLANT.

The object of this article is to show that electricity can be produced as cheaply, and in fact more cheaply, in the west than where labor and all other expenses are higher. The illustration shows the engine room of the Hotel Vancouver, at Vancouver, B.C. The steam plant consists of three return-tubular boilers 73 inches by 18 feet, with 72 four-inch tubes, rated at 150 horsepower each. The fuel consists of 4-foot fir slabs, and on an average 8.65 loads per day, of from 1 to 1¼ cords per load, are consumed.

The boilers are fed by a 10 x 6 x 12-inch simplex pump, the feed-water being heated, by an open heater, at from 200 to 220 degrees Fahrenheit, according to the back pressure on the heating system, the hotel and opera house next door being heated by exhaust steam. The heater and pump are situated under the bridge, at the right in the illustration, the boiler room being just beyond the wall. The floors of the boiler and pump rooms are on the same level, nine feet below the engine-room floor. The pump room contains a 3 x 2 x 5-inch simplex pump, which pumps the condensation from the house-heating system to the open heater, thus saving this water. There are also a 6 x 9 x 10-inch low-pressure simplex pump on the heating system in the opera house, which is lighted by the hotel plant, also one 3 x 2 x 3-inch pump on the returns from the kitchen and hot-water heaters; one 12 x 18 x 12 x 16-inch tandem compound and one 12 x 7 x 10-inch duplex pumps for elevator service. The exhaust-steam heater shown at the left in the illustration does the heating for the laundry.

The engine-room equipment consists of two Robb-Armstrong engines, with 13 x 14-inch cylinders, direct-connected to 75-kilowatt six-pole generators built to stand a 50 per cent. overload for two hours, without excess heating. The switch and gauge-boards are of marble.

A door in the rear right-hand corner leads into a large shop where repairs are made. The exhaust-steam pipe from the engines leads down under the floor and comes up through the room, as shown, where the heating-system main is taken off below the back-pressure valve. The kitchen steam supply runs under the heating main and supplies steam for the steam cookers, warming closets, etc.; also for two hot water heaters supplying the rooms. All of this piping, as well as the elevator-supply and return pipes, is run to the main



A Model Hotel Plant.

building through a brick tunnel, 6 x 7 feet in size, the plant being located in a separate building.

The daily expense of operation, based on an average per day per year, is as follows:

Fuel, 8.65 loads of slabs..............	$20.98
Engineer's and firemen's wages..	10.74
Water, oil, packing, repairs, etc.	3.71
Total....................................	$35.43

By close observation it has been estimated that the steam used for the pumps, heaters, laundry and kitchen will amount to as much as the engine consumes. The exhaust steam is used for heating, which with the work done by engineers in the building, will readily cut the cost of operating the electrical output to one-half the total cost, or $17.71. The average daily ouput in kilowatt hours is 929.33, therefore 17.71 divided by 929.33 equals 1.9 cents per kilowatt hour at the switchboard. This shows a saving of 1.1 cents per kilowatt hour over outside charges. The illuminating company gives a three-cent rate to large consumers on the sliding scale basis, three cents being the lowest and 10 cents the highest.

This shows a net saving of 1.1 times 929.33, or $10.22 per day, which will make pretty good interest on $7,500, the cost of the engines, generators and switchboard, etc. The year before that of which the above average was taken, the cost was only 1.49 cents per kilowatt hour. The increase was due to the increased cost of fuel and labor.—Power.

TRANSPORTATION BUREAU.

The council of the Montreal Board of Trade are energetically pushing forward the establishment of a transportation bureau. The need of such an organization is generally admitted. It is not intended by the establishment of this bureau to antagonize the railway interests but rather that the bureau should co-operate with them. The question of freight charges is a vital one in Montreal. With the centre of consumption of material moving gradually west, the increased freight charges on goods shipped places Montreal at a disadvantage in comparison with western cities. The duties of the transportation bureau will be to conserve Montreal's interests as a distributing point; to be represented at meetings of the Railway Commission; to facilitate adjustments through overcharges, delays, etc., and generally to advise members. One hundred and twenty members of the board have subscribed to the bureau, but the council want a larger membership than this before they see their way clear to go on with the project, and are appealing for further support.

FOUNDRY PRACTICE AND EQUIPMENT

Practical Articles for Canadian Foundrymen and Pattern Makers, and News of Foundrymen's and Allied Associations. Contributions Invited.

HOW TO MAKE PATTERNS.

By S. P. W.

As the idea of the size and shape of the work required will be conveyed to the patternmaker by a drawing, it is necessary that he should understand mechanical drawing and be familiar with the operations of the brass and iron founder. The pattern must be made so that a mold can be made from it in an expeditious manner. The patternmaker determines how the molder is to mold the pattern and must be acquainted with the properties of metals of which the castings are to be made.

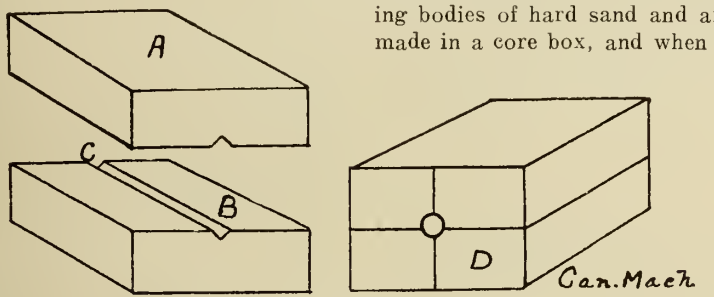


Fig. 1.

Kinds of Wood for Patterns.

Of the different kinds of wood serviceable to the patternmaker, mahogany is by far the best, as it will not shrink and is not liable to warp; will hold the glue well, is easily worked, and is hard enough to stand the rough usage of the molding shop, without showing wear. Next we have cherry, which is a very desirable wood, but requires more care in drying to prevent warping, and should be stored in the workshop for some time before it is used. It is harder to work, but will stand the wear, and good reliable patterns can be made from it. Pine is very much used, but is not desirable for fine, delicate patterns requiring durability.

Allowances for Shrinkage.

The patternmaker in his work must make all allowance for shrinkage and should understand the using of shrink balls. The usual run is ⅛ in. in 12 in., but we find some patterns shrink more than the rule, while some will make up the full size of the pattern.

In the making of locomotive cylinders the contraction of diameter is ¼ in. at the top and ½ in. at the bottom, and in length only ⅛ in. in 16 in.; thick brass, ⅛ in. in 12 in., thin brass, ⅛ in. in 10 in.; zinc and lead, 5-16 in. in 12 in., and copper 7-32 in. in 12 in. Much more could be said about the shrinkage of different shaped patterns, as the shape of the pattern has much to do with the shrinkage.

Cores and Boxes.

We will next take up cores, and how the boxes are made. Cores are projecting bodies of hard sand and are usually made in a core box, and when thoroughly dry after being baked in the oven, are placed in position in the mold. The use of cores permits modifying the required, also make them parallel in shape of the pattern which would otherwise be difficult to mold. A simple plan of making core boxes from wood either round or square is as follows: Take two blocks the exact length of the core width, run a gauge line along the centre of the sides as shown in Fig. 1, A and B; enlarge the gauge mark to a V as shown at C. The blocks thus prepared are clamped together and bored out with a bit the size of the core required. The spur of the bit will follow the V and you will have a very nice, round, true core box. Put in your dowels and the box is ready for use. Fig. 2 shows a method of building a square core box. Get out four pieces corresponding with 2, 3, 4, 5, square and dressed to gauge line; plane with your jointer the square required; fasten the pieces to a piece of plank as marked 1 and 6; put in your dowels and your box is complete.

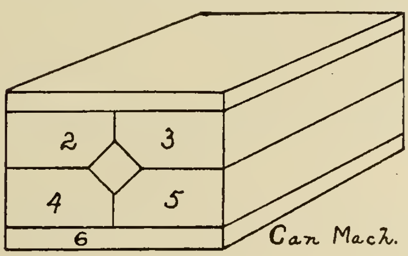


Fig. 2.

Practical Shrinkage Considerations.

To allow for the shrinkage in castings, the pattern is not infrequently made in form and size to meet the requirements of any known case. Suppose for example that the surface of a large casting is found to be hollow; then that surface upon the pattern should be made sufficiently rounding to allow for the shrinkage, thus giving the casting the desired flat surface. The patternmaker should be able to allow sufficient stock to meet the demands for shrinkage, and the rise in this case should be where the metal is the thickest, as that is the place where it shrinks the most. In the case of a solid cylinder it will be found to take place in the ends, leaving them conical in shape. As the surface of the cylinder is cooled by the walls of the mold first and has set while the central portion yet remains fluid. In a few minutes the central portion cools and in shrinking draws in the ends of the cylinder, the outer crust acting as a prop or stay to the atoms of metal adjacent to it. In the case of solid globular castings the central portion will usually be found hollow or porous, owing to the following causes. The walls of the mold cooling off the outer surface causes it to set quickly; the interior, cooling from the exterior inwards, endeavors to shrink away from the outer crust which resists its so doing; hence the interior is kept to a greater diameter than is natural, there being only a certain amount of metal in the entire mass. The atoms are drawn away from the central point in all directions to supply the demand made by the metal in shrinking.

In the case of flat, round disks or plates, they will usually be found hollow on the top side, although in some cases the hollow is on the bottom side. There are reasons for this. The top and bottom faces, together with the outside edge, becomes set first through contact with the mold. The centre will be the last to set. When the centre shrinks a severe strain is put on the plate which

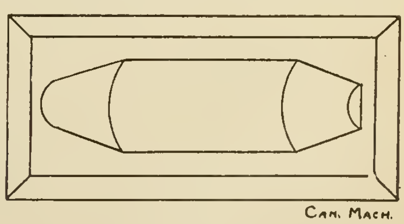


Fig. 3.

the outer edge resists. Now if the cope be thin the heat will radiate rapidly in that direction, causing the outer or top side to set first, the under setting later will drag the top side over with it, causing it to round up on top and dish in the bottom. But if the pattern be perfectly true, the cope and drag of the same tickness and both rammed evenly, there is no reason why the plate should not come out perfectly true, the strains being all self-contained in the same plane and balanced. If, however, the plate may have any projection downwards around the edge, it will likely be depressed on the top surface when cast. This is due to the projections setting last, and in shrinking, its tendency is to pull over the top side of the projection towards the plate, causing it to be hollow on the top side.

In parallel castings of any length having a cross section similar to a wedge, the thick side will invariably be found concave and the thin edge convex. But should the moulder strip the sand off the thick edge, leaving the thin edge covered, so that both edges will cool the same, the casting will be found very nearly straight.

Plaster of Paris Core Boxes.

I have given you an example of construction of wooden core boxes, but plaster of paris is nearly altogether used in construction of small core boxes and it is simple to get the box exact. A print is made, either of wood or brass. Take a square and work it through the centre exactly; then take a piece of flat board, true it out of wind; set the print exactly half way into the board; take some thick grease, such as tallow, and grease the print thoroughly and evenly; place a rough box over the print; make the box one-half inch longer than the joint, as in Fig. 3; mix the plaster well, stirring it to the thickness of cream. If hot water is used, it makes a better casting and if vinegar a still better, as the plaster will be hard and solid and not porous as it sometimes is with cold water. After filling the box

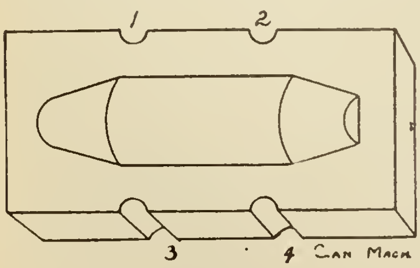


Fig. 4.

to give one-half inch over the print, let it stand a few minutes, remove the rough box, separate the plaster from the board and usually the print will lie in the plaster. Take a gouge, cut four places for lugs, as in Fig. 4 at 1, 2, 3, 4, giving them a good draft; replace the rough box and apply the grease. After the whole has been well shellaced, repeat the process of filling after your plaster has set; remove the box and you have a solid piece of plaster with the print in the centre. Pare off both ends to the length of the print and scribe from the end of the print, leaving about three-eighths

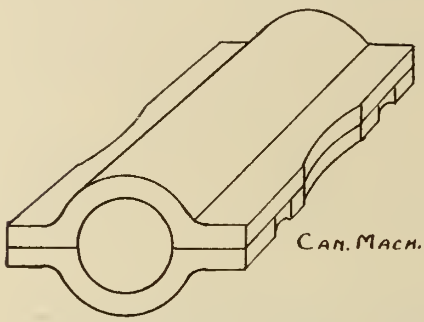


Fig. 5.

of an inch top and bottom and leave enough on the sides to give a good strong lug, as shown in Fig. 5. Curve between the lugs and the core box is ready for the sand. The shrinkage, together with the rapping, will give enough material to finish the box.

Boxes for large work are usually made in two halves. The flat surface allows it to dry on and bake and the two halves are pasted together, placed in the oven and baked until dry and it is ready for use. In the making of cores arrangements have to be made for vent. This is done by putting a wire in the mold. After the core is made the wire is withdrawn, leaving a hole sufficient to draw off all the gases, leaving the casting free from blow holes.

SOMETHING ON CORE MAKING.*

By Archie M. Loudon.

Core making is one of the most important parts of the art of founding, and yet for some little understood reason, the getting of proper results is left to chance in a great measure. The core room should be familiar to every molder just as much as his floor, but he dreads it very much it would seem.

Here is my experience with a variety of cores :

1. Radiator cores. These are safest and best made of bank or beach sand mixed with oil in proportion of one part oil to forty to sixty parts sand. Bake quickly until well browned. The result will be easily vented cores, and a ready extraction from the casting. This is important as the work must be entirely clear of the core before testing.

*Read before American Foundrymen's Association at Toronto.

2. Steam and water boiler cored castings. Use bank or beach sand with about 25 per cent. mash. Or, add floor sand to make the core stronger without having to use too much oil. The addition of oil is a particular matter and not readily controlled, for with too much oil the cores are more difficult to bake and become so hard that portions are left inside the castings, causing serious damage at times when these castings are used. The old sand helps the binding of the sharp sand, and as the castings are usually three-eighths of an inch thick, the oil is completely burned out, and the material easily extracted. The mixture best suited to this class of work is 75 per cent. sharp sand and 25 per cent. old floor sand. Then take one part of oil to fifty to sixty of the sand mixture.

3. Small cores for general use, which have to be kept in stock. These are safest when made of the mixture for radiator cores, if the castings are to be light or medium in weight. Small cores for heavy castings should be made from a good strong fire sand and molding sand with a somewhat refractory binder such as flour and graphite. This is necessary to get a good clear hole in the casting.

4. Small cylinder cores should be made from an oil sand mixture. Similarly the barrel core, as there is less liability of blow holes from such cores than from any others known in the art. Further, when the iron is machined a clean, smooth surface is left for the tool. The iron is also liable to remain softer. Hence this mixture should be used for port cores, exhaust and steam chest cores. Use straight beach sand and oil, in proportion of one oil to forty to sixty parts sand.

For barrel cores about 20 per cent. coarse molding sand mixed with 80 per cent. beach sand, with oil one to fifty of the sand, makes an excellent open core. Use this on cylinders up to 10 in. diameter. When the section of the casting becomes heavier a stronger mixture is necessary.

5. Large cylinders necessitate a strong but open mixture to have the results good. Fire sand, molding sand, sharp sand, each one-third. Mix with glue water, two lbs. glue in three gallons of water, the solution brought up to the boiling point only. This glue water to 100 lbs. of the sand mixture. Dampen the sand with additional water, it being understood that this is for large cylinder cores for immediate use, as well as dried molds in one form or other. The reason for using glue is that in this way we get the difficulty from gases down to a minimum. This mixture will care for all cores in cylinders with perfect reliability.

6. Large cores used for a variety of routine work must be made by the

foundryman with the different sands and binders he has, and the mixtures varied to suit his needs. A variety of formulae will give equally good results. My preference is as follows: For ordinary cores, one-third coarse molding sand, one-third beach sand, and one-third old sand. Mix these and take one part Syracuse dry compound with thirty-six of the sand mixture.

Where the large cores should be strong use one-third coarse molding sand, one-third fire sand, and one-third old sand, and for each thirty-six parts of the mixed sand use one part Syracuse dry compound, and one-half part flour. I mention this particular binder as it gives me the best results with the sands peculiar to my locality. Other binders, both liquid and dry, will go equally as well with the sands they are specially suited for.

Foundry Cupola Charging Machine Installation

Canada Car Co., Montreal, Have a Modern Installation for Conveying and Feeding the Charge. Description of Tracks, Cupolas and Machines.

An arrangement which has met with the approval of the management of the Canada Car Co., Montreal, is a system of conveying the charge to and feeding it into the cupola. It makes the whole work very simple, and two, instead of eight men, attend to the charging of the cupolas.

The idea is not altogether a new one, being employed in blast furnace practice. The elimination of labor effected a saving in the production of pig iron and lowered the market price. The blast furnace equipment has automatic features not applicable to cupola practice and the car has an end dump, while in those in the foundry of the Canada Car Co. are of a side dump pattern. This allows greater ease in handling cars and this can be accomplished in a narrow floor space.

The cupolas and machines were manufactured and installed by the Whiting Foundry Equipment Co., Harvey, Ill., represented in Canada by the Dominion Foundry Supply Co., Montreal. In Fig. 1 is a view of the pneumatic cupola charging machine with car in position on the platform before the cupola. Fig. 2 shows this machine in dumping position. The machine consists of a platform, hinged at a level above the charging platform on the side toward the cupola and is provided with a track for the charging car in a line with the stationary tracks, guard angles, as shown on the left, and a hook for holding the car to the platform when being dumped as shown on the right of Figs. 1 and 2. A dumping air-cylinder is supported on a frame attached to the charging floor and is pivoted to allow the alignment required. The piston rod is pivoted to a bracket beneath the platform. The platform is made of structural shapes securely riveted. An apron plate is hinged to the platform and laps over an inclined chute in front of the cupola door. The controlling valve is at the left of the cupola door and is connected to the air cylinder.

The action of the device consists in its being run on the platform, engaging the hook to the car frame, and opening the valve to raise the car to the dumping position. In the Canada Car Co. charging doors are on one side of the cupola, but in some of the later installations the Whiting Co. is putting them on both sides of the cupola, thus increasing the efficiency of the charging machine.

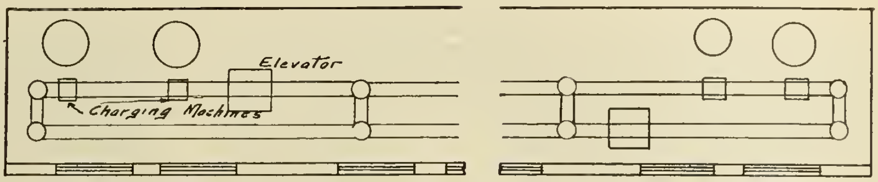


Fig. 3.—Plan of Cupola Charging Floor, Canada Car Co.

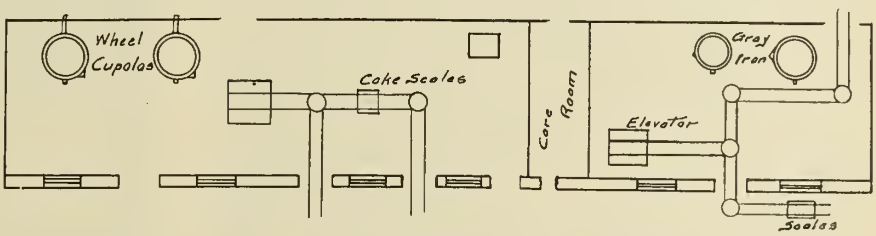


Fig. 4.—Ground Floor Plan of Cupola Department, Canada Car Co.

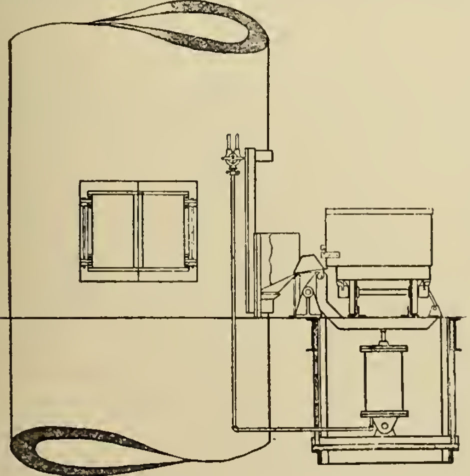


Fig. 1.—Cupola Charging Machine in Low Position.

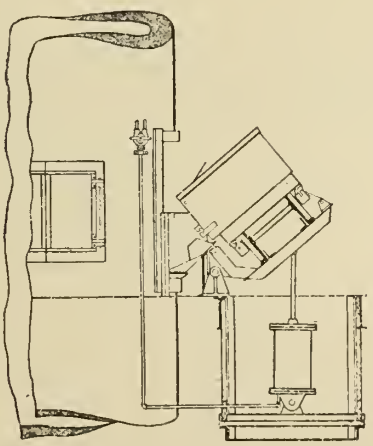


Fig. 2.—Cupola Charging Machine in Dumping Position.

In Figs. 3 and 4 is shown the layout of the Canada Car Co.'s equipment. Fig. 3 is the charging floor and Fig. 4 is the ground floor, and the sketches show the arrangement of the various parts of the equipment. There are two No. 9½ Whiting cupolas for the car wheel foundry and one No. 7 and one No. 4 for the grey iron foundry. All are equipped with charging machines. The two foundries adjoin and the charging houses are connected, giving ample track space on the charging floor and providing storage facilities below. The tracks on the charging floor are arranged with turntables so that cars may travel continuously, without delaying operations. In Fig. 4 is shown the relation of the scales and elevator and the efficient track arrangement with turntables, preventing any confusion or blocking of the cars.

Fig. 5 is a view of the charging floor in the Canada Car Co.'s foundry, showing one of the charging machines in the dumping position and the other ready to be dumped. Fig. 6 is a view of the pouring floor.

ANNEALING CASTINGS.*

By W. M. Carr, New York City.

Annealing methods in the foundry industry are recognized as established practices. No one will deny that in the malleable foundry annealing is a very important step. If there are in existence a diversity of opinions they do not conflict as to whether or not it is proper to anneal malleable castings. Whatever differences there may be hinge rather on methods. It is not fitting for me to present my views on the annealing of malleables or to discuss the effect of a heat treatment of hard iron. I cheerfully leave that subject and its intricacies to our friend, Dr. Moldenke, who has made a study of the matter and is fully competent to elaborate upon it.

In the manufacture of chilled cast-iron car wheels no dispute exists regarding their treatment in annealing pits. They would never be shipped or put into service without such treatment. The value of the treatment is fully recognized and receives as much attention and care as any step in their manufacture.

In the production of grey iron castings annealing is sometimes followed with a view to lessening certain stresses or strains set up in the cooling of the castings from the pouring temperature. The influence of the process in the case of grey iron upon the formation of the carbon compounds is not so important. If, however, changes should occur they would be in the direction of softening the surface of the castings.

In the three branches of the foundry industry just cited annealing is followed in the first instance primarily to change the formation of the carbon compounds from a hard, glass-like carbide of iron to the temper carbon, a substance not unlike graphite in its characteristics, conferring softness and malleability by certain methods of heat treatment upon a previously hard, brittle substance. In the second case, annealing lessens intense cooling strains in the plate and other parts of the wheel, but does not so affect the carbon compounds as to damage the depth and hardness of the chilled tread, throat and flange. In the third instance annealing concerns mainly the avoidance of cooling strains.

Coming to the steel casting industry we have a very important one in which annealing is open to some doubt. It may be the practice or it may not. That it has some value is a settled fact, but is not generally so recognized. When specifications so demand steel castings are put through an annealing furnace, frequently without any consideration as to the conditions of time and temperature. In the absence of annealing specifications steel castings are frequently shipped without such treatment.

Here we have the paradox of pains taken in the selection of raw materials, watchful manipulation of the melting and refining process in converting pig-iron and steel scrap of proper quality into steel, pouring it into molds of particularly refactory sand, stripping and cleaning followed by rigid inspection for flaws and imperfections outwardly visible and finally shipping to customer without annealing, delivering the castings with unknown stresses present, course, internal structure and other variables more or less liable to vitiate the value of the castings in service. If a casting shipped under such conditions should fail in service, all the precautions thrown around the methods of treating the raw material entering into it are wasted. The casting may be smooth, solid, true to pattern, of the proper chemical composition and the test bars examined from the same heat of steel meet standard specifications in tensile strength, etc., still with all apparent evidences in its favor, if it is not annealed before going into service there will always remain a doubt as to the life of usefulness. The casting may fail unexpectedly. I do not mean to say that annealing will make the casting infallible, but I do know with other conditions being equal that an annealed casting is less liable to fail in service than one not annealed. Surely then on the ground of consistency, in the light of modern methods, taking due consideration of all the preliminary operations leading up to the finished casting and eventually ignoring or slighting the final step of annealing, the step is of enough importance to demand proper attention.

Fig. 5.—View of Charging Machines.

Fig. 6.—Showing Pouring Floor of Foundry.

In annealing steel castings we have conditions that are not entirely comparable with conditions existing in other branches of the foundry industry where annealing is more or less essential. The operation is not concerned with the changes in the carbon compounds. That is to say, the same carbide of iron will be present both before and after the treatment. In the matter of internal structures there are mainly two components, first, the crystalline formation and its refinement resulting from proper thermal treatment, and, secondly, the removal or lessening of internal stresses set up in cooling down from the casting temperature. It is peculiar to most metals that they should crystalize when cooling from a temperature at which

* Presented before American Foundrymen's Association at Toronto.

they are cast and the size of the crystals vary with the temperature and rate of cooling. The size and formation of the crystals have a decided influence upon the physical properties of the castings. Upon reheating metals to what is known as a refining or annealing temperature the grain or crystals of the metal will become smaller than their original form and with the change in structure will come better conditions physically. The castings will be tougher and better fitted to accomplish the work for which they may be designed. The refining temperatures are not the same for all metals, but, generally speaking, a suitable temperature to grain refine cast steel is about 825 to 850 degrees centigrade.

There are, however, practical considerations to take into account that cannot be determined entirely by laboratory tests, such as the length of time to anneal a casting of a given shape and size, the style and type of furnace best suited to certain requirements. These points are capable of determination through the character of the product and the probable tonnage.

METAL MARKET SITUATION.

Although there has been no striking stimulation in the metal demand during the month, the buying has evidently been more liberal, as a stronger tone has been observable in the markets during the last two weeks. Part of the improvement may be ascribed to the growing confidence in the autumn trade induced by the prospects of great crops in the United States and in Canada, thereby making holders disinclined to cut prices to force sales; but undoubtedly a very large part is due to an increase in the general demand caused by the greater industrial activity. Large orders are still conspicuous by their absence, but the small orders make up a fairly good aggregate. Judging from the absence of those bulky orders which characterized the demand last year, it would appear at first sight as if the demand all through had been poor. But this has not been the case, as we have before pointed out. The orders have been small, but they have been fairly frequent, and this goes a long way towards making up for a large order placed over an extended period. Merchants in Canada have been surprised to find on making up their returns roughly that the business done up to now has been much greater than they believed to be the case. No doubt this is the same in many other industries. All the metals have strengthened in the primary markets, and in Canada as well. Quotations themselves have not much altered, but they are more firm.

Tin has been undergoing in London another of those remarkable bulling movements which characterize the metal from time to time. Little dependence can be placed on this speculative metal; London manipulators being in such a favorable position to command the market. Prices in the States have, of course, gone up with the London quotations, and figures have also strengthened in Canada, but not to such an extent. Quotations are now from \$32 to \$32.50, with a fairly active demand.

Copper continues very steady in New York, although suffering from fluctuations in the English market. However, taking the month's progress, the metal may be said to have strengthened across the Atlantic. Exportations to Europe have been keeping up well, and at the same time the domestic demand, while not showing any great improvement, is very steady. It is probable that much more copper is going into consumption than is imagined to be the case. Canadian mines have been increasing their production steadily, and it is a good sign that all the metal apparently is being used in one form or another, and not being stored up in warehouses. Canadian prices range between 13½c and 14c.

The pig iron situation has varied very little, that is, so far as the United Kingdom and Canada are concerned. There is some fear that prices in the Old Country will decline owing to a threatened falling off in the German demand, but figures show little signs of any great weakness as yet. Cleveland warrants keep up their high price in a remarkable fashion. In the States, conditions continue to improve with the approach of the harvest. The various plants are more active, and the volume of new orders for bars and kindred products are reported larger than at any time since October, and specifications in all finished lines are being "more freely received by the mills.

Spelter is stronger than it was in the primary markets, but stocks had accumulated so heavily that a strong demand is necessary before the situation can improve to any great extent. Still things are brighter with the better tone noticeable in the more important metals, and, locally, the price is very firm at \$5 to \$5.10.

Lead, likewise, has taken an upward turn, and is reported to be in a stronger position. The Canadian demand is still somewhat quiet, and there is no change from the last month's quotation of \$360.

THE ALUMINIUM CORPORATION, LTD., OPEN OFFICE IN TORONTO.

It will interest our readers to know that the Aluminium Corporation, nonferrous metal manufacturers are opening offices in Toronto in the Continental Life Building. This corporation, with a paid-up capital of \$2,500,000, has its head office in London, Eng. and large reduction works situated at Dolgarrog in North Wales, and Wallsend-on-Tyne, Eng., in which over 12,000 hydro-electric horse-power are being utilized. The company's reduction works have a present capacity of over 3,000 tons of aluminum per annum, but this capacity is being increased to 6,000 tons to meet the increasing demand for the product. The company also has alumina refining works at Hebburn-on-Tyne. The company owns very extensive deposits of beauxite or aluminum clay in the Province of Varennes in South-eastern France. This supply of raw material is practically inexhaustible.

The company in addition to manufacturing pure aluminum and furnishing it to the trade in the form of ingots, sheets, tubes, rods, bars, and special shapes, makes a specialty of manufacturing alloys and aluminum bronzes, which are very widely used in the metal industries.

Use of Aluminum in Foundry.

In iron and steel foundries, aluminum is used as a reducing agent, in refining cast iron, steel and other metals, as it prevents the foaming and frothing which impede the flow, removes impurities, reduces the wastes and produces solid castings free from blow-holes, and renders them much more suitable for machine work. On adding the aluminum, it at once decomposes any dissolved or intermixed oxides that may be present, forming alumina, which quickly rises to the surface as a light slag, carrying along with it any suspended foreign matter. As a result, the metal is rendered more fluid, the castings are free from blow-holes, are sharp and perfectly solid ; they also show greater homogeneity in grain, the sand scale is lessened, and the metal more easily worked. On addition of aluminum to molten steel the ebullition is not so violent.

Aluminum is invaluable as an alloy with copper, zinc, nickel, tungsten or wolfram, as alloys may be made of the very highest tensile strength according to the percentage of the metal used ; for instance, aluminum bronze which is one hundred per cent. stronger than gun metal and equal to hard tool steel, is much used for boat propellers, etc.

Other Uses of Aluminum.

The extreme lightness and strength of the metal and its alloys has made it an absolute necessity for gear castings, radiators, crank chambers and other parts of automobiles.

Aluminum is rapidly gaining favor for cooking utensils on account of its light-

ness and freedom from liability to corrode, and is also used very widely as a substitute for brass, for hat racks, coat hooks, bedsteads, wardrobes, drawer handles, door knobs, coal scuttles, stair rods, lavatory fittings, portable lamps, gas and water fittings, electroliers and many other articles. It requires far less cleaning than brass, never loses its color and does not soil as quickly, and in many instances it presents a more pleasing appearance, while even the present low price of brass it is cheaper. It can be used either buffed, equalling the best nickel or silver-plating in appearance, or dulled to a grey matt color.

In shipbuilding and railway work, aluminum is used very extensively. The new Cunard steamships "Mauretania" and "Lusitania," which represent the latest styles of shipbuilding are equipped with aluminum rails, lift gates and fittings of every description.

Aluminum in addition to being the lightest of all metals is very easy to cast and spin, and is very ductile, so that founders and spinners find the working of aluminum very easy.

In recent years, aluminum has been found to be an excellent substitute for copper, for electrical power transmission lines, railway feeder circuits, central station bus-bars, etc., being not only much lighter, but less expensive than copper even at present low price of that metal. As an instance, the high voltage power transmission lines radiating from Niagara Falls to Buffalo, Lockport, Rochester, Syracuse, etc., and many other transmission systems, are constructed of aluminum and have proven to be very satisfactory after several years of trial under severe conditions.

SOME LATE SOUVENIRS.

Something exceptionally fine in the way of a souvenir has been mailed by the Robeson Process Co., of Sable Forks, N.Y., makers of Glutrin, to those registering at the booth at the Toronto convention. It is a handsome leather bill folder, stamped with the name of the person registering in gold letters. This souvenir will be carried by the friends of the Glutrin people for many a year.

* * *

A very neat hat brush has been mailed by the Osborne Mfg. Co., Cleveland, O., to their friends. The box contains the card of Franklin D. Jacobs. This is a most useful souvenir, and forms a good companion for the clothes brush given by the firm last year.

OBITUARY.

Mr. W. C. Ross, foreman of I.C.R. shops at Richmond, Que., is dead. Age 52 years.

PERSONAL MENTION.

Fred Voss, representing Burmeister & Wain, machine and shipbuilders, Copenhagen, Denmark, has opened up an office at 13 St. John Street, Montreal.

* * *

H. Norton, A. O. Norton & Son, Coaticook, Que., attended the convention of Master Car Builders' at Atlantic City.

* * *

Geo. W. Sadler, of Sadler & Haworth, has been elected president of the Montreal branch C.M.A. by acclamation.

* * *

Roland Yates, of London Machine Tool Co., Hamilton, is making a tour of the Maritime Provinces.

* * *

Mr. Fred. A. Johnson, president of Gisholt Machine Co., Madison, Wisconsin, died in Denver, Colo., May 26th. Mr. Johnson had been connected with the Gisholt Company since its incorporation in 1887, and became its president in 1901. He took an active part in the management of the business and spent several years in Europe in the interests of the company. Since 1904, however, owing to ill-health, he had been unable to attend to business.

* * *

Five Canadians have been elected presidents of American railway institutions, the last four named being members of the Canadian Railway Club, Montreal. This speaks well for the high standing which the Canadians rank in American institutions.

* * *

Mr. W. McNab, principal assistant engineer G.T.R., Montreal, elected president of American Railway Engineering & Maintenance of Way Association.

* * *

Mr. J. H. Callaghan, general storekeeper C.P.R., Montreal, elected president of Railway Storekeepers' Association.

* * *

Mr. W. J. Camp, superintendent C.P.R. Telegraphs, Montreal, elected president of Association of Railway Telegraph Superintendents.

* * *

Mr. H. H. Vaughan, assistant to vice-president C.P.R., Montreal, elected president of American Association of Master Mechanics.

* * *

Mr. James Powell, chief draughtsman, motive power department, G.T.R., Montreal, elected president of Association of Railway Club Secretaries.

* * *

Mr. John R. Morgan, formerly chief engineer of the Morgan Engineering Co., of Alliance, Ohio, has been appointed general manager of the Calumet Engineering Works, Harvey, Ill.

S. Woodhall, foreman H. R. Ives & Co., Montreal, has resigned to accept a similar position in the Enterprise Foundry, Sackville, N.B.

* * *

Frederick Lane, formerly with the Crosby Steam Gauge & Valve Company, and more recently employed by Wm. B. Merrill & Co., has become superintendent of Jenkins Brothers., Ltd., Montreal.

* * *

F. Heaven, representing T. S. Hall, Bristol, Eng., manufacturers of general plate and sheet metal, visited Montreal last month. He will study the Canadian markets and appoint agents to look after his company's trade here.

* * *

Fred. Schuck, Montreal, has been appointed Canadian agent for Wiley & Russell, Greenfield, Mass., and Horton & Son, Windsor Locks, Conn.

* * *

A. M. McFarlane, Montreal, who has been appointed agent for Brade's steel, manufactured by Wm. Hunt & Son, Birmingham, Eng., has just returned from a business trip to England.

* * *

J. A. Mitchell, foreman of the motive power department of the G.T.R. at Stratford, and who has been transferred to a position of trust and influence with the G.T.P., has been honored by his associate employes. He was the recipient of valuable gifts from the Brotherhood of Locomotive Engineers and the employes of the roundhouse. Both presentations were accompanied by addresses of eulogistic reference to Mr. Mitchell's ability and faithfulness, and expressing the best wishes for his future success.

* * *

Ralph Ditty, formerly general manager of the Buckeye Milling Co., Cleveland, has assumed the management of the Federal Foundry Supply Co., Cleveland, O.

OUTING OF RAILWAY CLUB.

The Central Railway and Engineering Club held an outing to Jackson's Point, on Saturday, July 18. There was a splendid turnout and everyone enjoyed himself.

Van Depoele, a cabinet-maker of Detroit, Michigan, took up the study of electricity for evening amusement, and he became the inventor of the overhead trolley system and a highly successful constructor of electric street railways. One of the largest truck farmers of Marblehead, Massachusetts, developed from a dry-goods clerk who used to cultivate a few vegetables in a small suburban lot.

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and Manufacturing News

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OFFICES:

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MONTREAL - 232 McGill Street, Phone Main 1255
TORONTO - 10 Front Street East, Phone Main 2701
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SUBSCRIPTION RATE.

Canada, United States, $1.00, Great Britain, Australia and other colonies 4s. 6d., per year; other countries, $1.50. Advertising rates on request.

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Vol. IV. AUGUST, 1908 No. 8.

SPLENDID BUSINESS OUTLOOK.

There is a marked improvement in general business and continuous and substantial progress is being made. A feeling of buoyancy prevails, influenced greatly, perhaps, by the activities in railroad circles. At Montreal and Stratford the G.T.R. shops have been put on full time, and at the Angus shops the staff of mechanics has been greatly increased, in addition to the hours being extended from forty-five to fifty-four per week. The Montreal Locomotive Co. and the several car shops are showing activity. The C.P.R. has placed an order with the Montreal Locomotive Co. for twenty locomotives, and they are turning these out at the rate of two a week.

In the near future Montreal will have another locomotive works, the Imperial. Tenders have already been asked for, and it is expected the foundations will be built this autumn.

The sale of machine shop supplies is picking up wonderfully. Stocks were low and now there is a hurry to replenish them. Some good orders for machine tools are reported, and the railroads have called for immediate deliveries. The lead of the railroads is followed by smaller plants, and July has shown quite an improvement over June. There have been some bookings for electrical and other power machinery, and inquiries along all lines are increasing in volume. They are of a much more substantial character than those received during the past few months. Their general tone denotes contemplated plans of extension. In some plants new machinery and power equipment, which, under ordinary circumstances would have been placed some time ago, is now being ordered.

In the Maritime Provinces business conditions are looking excellent. Reports indicate prosperity in all branches of industry, forecasting a complete revival of trade. In Truro all the manufacturing lines are busy, and throughout the Province of Nova Scotia business is excellent and collections are good. Nova Scotia Steel Works is fairly busy, and the Dominion Iron & Steel Company is working steadily with increased production in every department. Trade reports during the past month are, on the whole, very encouraging.

HOW CROPS INFLUENCE TRADE.

Every few days very encouraging reports are made of crop conditions in Canada and the United States. These reports seem to indicate that there will be a bumper crop this year, the greatest that has been. The effect of this can be seen on every hand. The railways must prepare to handle the crop. This means increased rolling stock. Result, railway shops are given lots of work. Facts concerning this are given in another column. The railway shops are again busy. The railways are the largest buyers in the country. This must have its result upon general trade conditions. And it is having its result, which has been felt quite distinctly in very many quarters in the last few weeks. This all goes to show the important part crop conditions play in general industrial conditions.

SYSTEM REVEALS INVISIBLE EXPENSES.

In prosperous days, when a manufacturer's time and thought are completely taken up with the problem of making prompt deliveries, it is human nature that the importance of cutting down every little leak and unnecessary cost should not appear paramount. But in slack times the importance of saving every cent possible should be realized fully. The value of accurate manufacturing and cost systems should be quite apparent, because it is only by knowing every detail cost that a manufacturer can tell how he can reduce unnecessary expenditure.

There are certain invisible expenses that are never revealed, because either there is no system, the system is cumbersome or the system is not being put into effective use. Even under best conditions invisible expenses creep in and it is only by the adoption and application of system in every department that these expenses are brought to light. Various items of invisible expense may be revealed. The laborer that costs $1.50 a day may be found expensive when compared with the man who costs $2.00 a day. A clerk assisting a superintendent and foremen, and looking after details, may affect a saving by allowing them to give the workmen more attention. A power plant may pay for itself in a few years by the installation of some economical boilers, efficient engine, condenser or pumps. Pattern lumber may be the cause of loss, only detected by investigation and results shown by a comparison of costs.

An apparent saving in the cost of coal may really be a loss when measured in heat units per dollar spent. Sometimes the buying clerk thinks he is affecting a saving by ordering a cheaper grade of coal, but a comparison of the

cost of power revealed by a good cost system will show that the saving is only an apparent one. Pattern lumber, labor machinery and coal must all be watched as being sources of invisible expense.

To reveal such expense instal a good cost system and place a competent man in charge. It looks like an added expense, but by placing a man with the proper ability at the head, expense will be revealed and data will be obtained that will more than warrant the outlay. Enter the scheme with faith and employ a man who can turn on the searchlight. Do it properly or not at all. If the system is incomplete it is worse than none. You think you know and you know not, which is worse than not knowing. If the system is carried out consistently and intelligently the business will be placed on such a sure foundation that the manufacturer can tell the exact cost of everything at any time.

It will pay you to instal a good cost system.

DUE TO GOOD BUSINESS METHODS.

The following sentence taken from the report of the Dominion Iron & Steel Co. is significant of the good business methods of this corporation:

> "Our earnings during the year include $883,113.47 for bounties on iron and steel. This does not include the bounties on wire rods, which enter Canada free of duty. As we advised you last year the underlying bounties decrease during the current financial year, and run off entirely during 1910. So far as we can foresee, the further reduction in costs which we have counted on to offset the falling off in bounties will be reached in good time. We are improving steadily in that respect."

To so reduce manufacturing and operating costs is a sign of live management. This corporation cannot be working on guess work. Good, sound business principles and systems must be in operation.

This corporation has felt the slack times less than any steel corporation on the continent. Some unkind person gave to one of the management as a reason that they were too slow in Nova Scotia to keep up with the times. But we put it down to good, sound management.

CONDITIONS IN U. S. AND CANADA.

Some light has been thrown on the relative conditions of industry in Canada and the United States by the response to a recent advertisement for a mechanic familiar with certain lines of industry to travel for the manufacturers of special mechanical supplies. There were in the neighborhood of 350 applications in reply, and of these about 250 were personal, and the remainder by letter. Of all these there were only six Canadians, and the Mother Country was represented by four Englishmen. The rest were from the cities across the line, and had come to Canada on account of the failure of employment at home. The contraction of operations by the big railway corporations has thrown a great number of machinists and steamfitters out of work. The big manufacturing concerns have also curtailed operations.

TALK FROM THE EDITOR.

There are a number of good things in the August issue which our readers should not fail to digest. The July issue was distinctly a foundry issue, containing a complete report of the convention. In this issue we have made an effort to give our machine shop readers something particularly good. But our foundry readers have not been neglected. We have also some good things for those responsible for results in the power house.

Nearly every large machine shop in Canada is after information on grinding. Nearly all are trying experiments. The article by F. N. Gardner, giving the results of a series of tests with disc grinders will not only prove interesting, but valuable. He also gives illustrations of some interesting jobs done with the disc grinder. Mr. Gardner has grown up among grinding problems and knows something about them.

Cold galvanizing, or more properly electro-galvanizing, has always been looked upon as a very desirable process, but too expensive. An article in this issue describes the electro-galvanizing plant in the Frost Wire Fence Co.'s works, telling about the advantages of the process, how it is conducted and the cost. The possibilities of electro-galvanizing are great, and should be investigated thoroughly by manufacturers who employ galvanized product.

Everyone has a spyglass out to see where he can cut down expenses—or he should have. An article in this issue tells how the expenditure on tool steel can be cut down by using the new profile steels. From these shapes cutting tools can be made with less labor and with a saving in weight of steel. The article illustrates these shapes and tells what tools can be made from each.

For the designer and the man who is responsible for the manufacture of worms and worm gears, the article by John Edgar on the design and manufacture of worm and gear drive should prove invaluable. Mr. Edgar is an expert on this work, and has much to tell in his article of great interest and value.

Labor saving machinery in the foundry is making wonderful progress. One had only to attend the foundrymen's convention in Toronto to see that. An article in the foundry department of this issue illustrates the cupola charging machine installation in the Canada Car Co., Montreal. It is a most interesting installation. There is also an article on pattern making for the beginner. Short articles on core making and annealing castings contain concise and useful hints.

An article in the Power Generation and Application Department tells how a great saving in oil was made in an engine room by the adoption of a simple method of filtering. Every manufacturer should read this. Perhaps hundreds of dollars might be saved in the same way. Another article tells about the remarkably low fuel consumption in a hotel steam power plant.

For the next issue we have in view many articles of equal interest and value. One is a graphic story of the struggles of the machine tool builders in Canada in the early days. This will be an article of human interest. Another feature of next month's issue will be the report of the convention of the Canadian Association of Stationary Engineer.

Modern Machine Tool Practice and Its Future Development*

Relative Cost of Production by Automatic, Semi-Automatic, and Hand Machine Tools—A Prophecy as to Lines of Future Development.

By H. I. BRACKENBURY

In the following it is intended to touch but slightly on the design of machinery, but rather to give an account of those forces which have tended to make machine tools develop along certain lines, and to show that there are forces now at work which considerably alter our views and ideas as to the value of certain classes of machinery. These remarks will be limited to small machinery, as being of the most general interest, and only those machines which cover the same ground as the engine lathe will be considered.

Classification of Machine Tools.

Modern machine tools may be classed as follows: (a) Automatic machinery, for which the tools are designed, made, and set in the machines by highly skilled labor, the material being fed into the machines by unskilled labor.

(b). Semi-automatic machines, for which the tools are generally formed to give the work the required shape, and stops set on the machine to give the required lengths and depths of the cuts, the operator having little more to do than to pull or turn certain handles. Under this class come turret lathes, screw milling machines, screw machines, etc., in fact, all those machines where the tools can be made and set by skilled labor, and then worked by less skilled labor.

(c). Machines which develop the work under the guidance of skilled labor to a drawing or sample, the sizes being obtained by the use of gauges or the micrometer. Such machines are the engine lathe, heavy turret lathes fitted with lead screws, etc.

(d). Grinding machines for finishing work, where considerable skill is required in the handling of gauges, but very little skill to work the machine.

It has been the aim of many machine users to push work from class c into class b, and from b to a, and this the machine builders have encouraged, bringing the automatic and semi-automatic machines to great perfection. But they have tried to carry this too far, even under the old conditions; and it might be proved that the conditions, upon which the value of automatic and semi-automatic machines rested, have been completely upset by the general adoption of high-speed steel, and that the claims of the old simple type of engine lathe come once more to the front. These are the days of specialization. Manufacturers tend to specialize in one size of article as much as in one class of article. Meanwhile machine tools have become more and more complicated, one type of machine being suitable to cope with a large variety of work, but in the future they will tend to return to the simpler patterns of former years; but one machine will be designed for turning out one class of article, or, rather, for doing one or two operations on one article.

Relative Cost of Hand and Automatic Machinery.

Until a few years ago the time and labor required for rough drilling, turning, etc., was a very large consideration in the total cost, including material; and it was, therefore, desirable to do much of this work with automatic machinery, where one man could attend to, say, four machines. But by the introduction of high-speed steel the cost of roughing-out has been immensely reduced, certainly as low as one-third the former cost. The price of material and of the more intricate types of machines has risen, the result being a complete alteration of the proportionate value of the labor to the cost of material and machine charges. The production of one automatic machine on the larger class of work is slower than the production of a hand-worked machine; and, therefore, extra capital charges are involved for shop room.

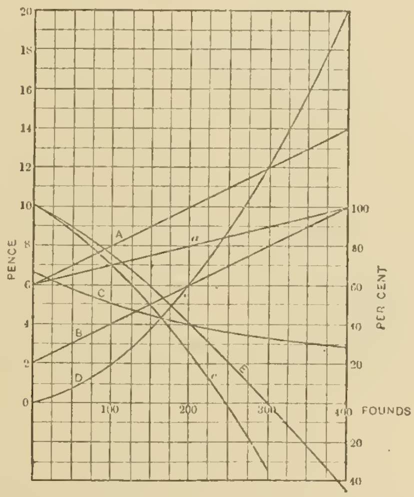

Fig. 1—Diagram of Relation of Cost of Running Automatic and Hand Machines.

The price of an automatic machine is at least double the price of a hand machine suitable for turning out the same piece of work; and very often on the automatic more material must be used, and of a more expensive nature, a point which the machine builders are apt to leave out of consideration. Future development will not be in the direction of larger and more complicated turret or automatic lathes, but in the direction of simple machines which can be attended to by operators of average intellect and who have not had much previous experience of machinery.

Formula for Determining the Cost of Machine Operations.

The following formula may be used to compare the value of various machines in turning out work:

$$\text{Wages per hour in cents equals } \frac{\text{Price of machine in dollars}}{125}$$

Cost per piece in cents equals

$$\frac{\text{Number of pieces made per hour}}{} \text{ plus } \frac{\text{Cost of tools and setting up in cents}}{\text{Total number of pieces}} \text{ plus}$$

cost of material per piece in cents.**

This formula seems complicated, but all this must be taken into consideration in comparing the economic value of different machines for producing the same piece of work.

If we now turn our attention to the curves drawn in the diagram, Fig. 1, we will find there the relative cost of running ordinary lathes and automatics. (In this diagram the English money standards have been retained).

The curve A indicates the cost of running hand machines of various first costs, with a charge for attendance of 6 pence per hour, and a charge of $\frac{\text{cost of machine}}{5}$ per annum for interest, depreciation, floor space and repairs, which works out at 2 pence per hour per 100 pounds.*

Curve B indicates the cost of running automatic machines with a charge for

* Abstract of paper read before British Association of Engineers.

** In this formula the money values have been reduced to Canadian money standards.

* For all practical purposes there are five dollars in one pound, and two cents in one penny. Thus these values can easily be changed to Canadian money.

attendance of 2 pence, and machine charge as above, The 2 pence is supposing a charge of 8 pence per hour for attending four automatics; and except on the simplest work, this figure would be exceeded.

Curve C represents the saving of running automatic machines in place of hand machines. It must be understood. that this comparison involves running cost only, and does not take, so far, into account the amount of work turned out.

Curve D, finally, shows the actual cost of doing on an automatic machine a number of pieces of work which could be done on a hand machine in an hour. The automatic is taken at the same price as the hand machine. It is assumed that more work can be done in an hour by an automatic machine of under 200 pounds cost than can be done by a hand machine, and that above 200 pounds cost the automatic does less work than the hand machine. This is confirmed by actual practice. In the curve, which shows merely the tendency of the piece price to rise on expensive automatics, the ratio of production of the automatic is to the hand machine. as 2 is to the price of the machine in hundreds of pounds, that is, if the machine costs 100 pounds, the production is in the ratio of 2 to 1, at a price of 200 pounds for the automatic, the ratio is 2 to 2. at 300 pounds, 2 to 3, etc.

It may be said that the automatic machines show a saving when the capital cost is not more than 250 pounds each. After this figure a loss is shown which increases very rapidly. This is best shown by curves E and e, which give the percentage gained or lost by using automatic machines of various values, as compared to hand machines. Curve E is for automatic machines of the same value as hand machines, but in curve e the hand machines are taken at half the cost of the automatics ; probably a suitable hand machine, to do work being done in an automatic, would cost less than half the automatic.

Figures are often shown which seem to prove the great value of even large automatics and expensive and complicated turret lathes. In certain cases these figures are correct, but in many cases the saving is largely due to the carefully thought-out method of doing the work, where formerly little, if any, attention had been given to the study of economy in the old machines. A case is pointed out where the time for doing a piece of work was reduced by the use of a large and expensive turret lathe from 4½ hours to one hour. There bein more of the same work to do, it was determined to try what could be done in the old lathes. A few special tools were made, and the method of procedure very carefully thought out. The result was a time of 1 hour and 10 minutes for the work.

We now turn our attention to a set of curves, Fig 2, showing the actual proportionate cost of wages only on bolts made, A, in an engine lathe, B, in a turret lathe, and C, in an automatic. It will again be noticed that the automatic shows a large saving on the smaller sizes ; for the larger sizes the engine lathes show the cheapest method. The turret lathes show much the same as the engine lathes, but the machine charges would be much higher for both the automatics and the turret machines.

The Proper Application of Automatic Machines.

The automatic shows to the best advantage on simple work, when the cutting time is a large proportion of the whole time. The reason for this is that the time taken to change from tool to tool on the automatic machine is longer than that required on the hand turret machine. Thus, the longer the cutting time, and the fewer the number of tools employed, the better is the result from the automatic. Of course, these curves are hardly even approximately correct for any article of manufacture, but they show the tendency very clearly of the work to become more and more expensive as the size of the automatic machine increases. It is certain that more than one manufacturer who has started a new shop with the idea of doing as much as possible by automatic machines to keep down labor cost, has been surprised to find that some other shop with a few cheap machines is turning out the work quite as cheaply, and when slack time comes he considers with sorrow the capital locked up in his beautiful battery of automatics. Now, from the foregoing we may safely argue that the large automatic machine is a creation of the past, and that the future will bring no further development in this direction. The simple automatic machines of small size are of the greatest value. The complicated machines for work requiring many short operations are not economical: Tracing the history of the automatic machinery, we find it was largely due to the bicycle becoming such a universal favorite, thousands and thousands of small parts being required of an exact similarity. Comparing the price of the first safety bicycles to the present prices, one will obtain an idea of what this automatic machinery has done to cheapen the production of small parts in large numbers.

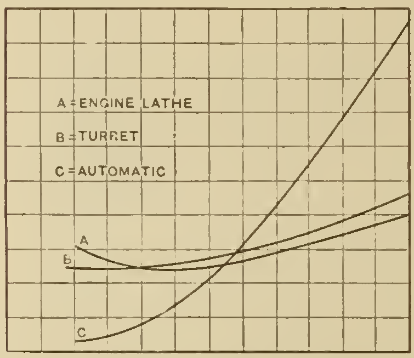

Fig. 2—Diagram Showing Relative Cost of Labor for Bolts Made in Different Machines.

The turret lathe has increased in size and power within recent years. For many purposes, when there are many short operations to be done at one setting, and little material to be removed, these machines are very valuable. The proper sphere for large and expensive turret lathes is for finishing work of a complicated nature and it is in this direction that the machine will be developed. To occupy a machine costing perhaps five hundred pounds, with work which can be roughed out in a machine costing a little over 100 pounds, and worked with cheaper labor, is quite out of the question.

We come, then, to this conclusion :—The use of automatic turning machines is for small work of a simple nature , the use of large, expensive turret lathes is for finishing work of a complicated nature or form, requiring considerable variety of tools.

The Future of Simple Hand Machines.

To rough the work to nearly the finished sizes we require simple machines : a, heavy, simple and cheap turret lathes for boring and chuck work ; b, heavy, simple and cheap engine lathes ; c, similar to b, but fitted with scroll or plate for forming the work to shape. Curiously enough, these machines, which seem the most simple and easy of perfection, give the most room for development. The reason of this is that the great value of roughing-out work in cheap machines with cheap labor has not been sufficiently grasped. In the design of these roughing-out machines the driving should be done by means of a single pulley running on a back shaft with a wide belt, and not a cone pulley ; the change of speeds would be obtained by means of sliding gear wheels made, of course, of steel. The teeth should be of small pitch, and not necessarily wide. We may take a lesson here from what the small gears in motor cars are able to stand.

The obvious disadvantages of the cone pulley are two : a, with wide belts to change the speed it is a time-wasting process and apt to be dangerous to the inexperienced ; b, a varying power is passed through the belt. Taking as an example a lathe of well-known make, the horse-power carried by the belt varies from 12.95 to 4.57. Evidently the value of a large range of speeds is very doubt-

ful when it is combined with such a range of horse-power.

The feed should be obtained by means of a lead screw of ample dimensions, bearing in mind that the pressure required to feed the tool is equal at times to the pressure required for cutting. The feed changes should be given by sliding gear wheels. The nut should be of cast iron, as this gives a longer life than the usual gun-metal nut. The bed and headstock should be cast in one, and should be of ample weight. The bed should be one with square edges and a step on the cutting side, permitting of less twisting action on the saddle. The section of bed should be of the double-H beam type. Ample provision must be made for taking up the thrust by means of ball bearings or wide collars. In designing these machines one must keep in mind that the aim is not a perfect machine, but a machine of simple construction, simple to work and cheap to buy, and of considerable power. These machines should not be arranged for screw cutting.

There remains now the question of threading work. Bolts and such work should, of course, be threaded by means of self-opening dies, as this is much the cheapest method. But where great accuracy of pitch, or threads of coarse pitch, such as worms, are required, recourse must be had to either the lathe or the thread milling machine. This latter machine is the most universally useful, and there is a great future before this type of machine.

Concluding his paper, the author said that he feared many would come to the conclusion that he advocated a retrograde policy in drawing attention to the merits of the simplest machines. "But in advocating these machines," he said, "I do not wish to bring back the old methods of using them, for the most careful consideration is required to find the method which will give the best results. I, least of anyone, would wish to belittle the value of the small automatic and large complicated turret lathes which have been brought to such wonderful perfection in modern times, but I ask machine users to keep such machines in their proper places, and weigh carefully the merit of simpler and cheaper machinery."

THE WARREN VERTICAL GAS ENGINE AND PLANT.

There are three features of this engine, shown in the accompanying illustrations, which should prove of special interest to readers of Canadian Machinery. These features are, first, a design of the bearings, permitting close adjustment without the danger of throwing the crank shaft bearing out of alignment; second, the design of the cylinder, which while preventing any possibility of water leaking into the explosion chamber, permits of the expansion of the inner wall, without throwing any stress on the casting; third, the system of lubrication.

Taking up these three features in succession, the main bearings are carried on bolts, which extend through to the top of the crank case, example of which can be seen at A Fig. 2. Adjustment is made by removing or inserting the necessary number of shims or liners between the two halves of the bearing. This feature prevents the bearings from being pulled out of alignment since these shims are made accurately to a uniform thickness of 1-1000 part of an inch, and no matter what force is exerted on the wrench adjustment cannot be made to a greater extent than the thickness of the shims which have been removed or inserted. The only thing to be watched is that the same number of shims are inserted or removed from each bearing. It will be noticed that the middle bearing, B, Fig. 2, is of the same size as the end bearings, which is contrary to the usual design.

At A, Fig. 1, can be seen the provision which has been made permitting the expansion of the inner wall of the cylinder. This is a feature which is not to be found in anything but heavy duty tandem type of engines. Its advantages are obvious. Round rubber gaskets form the slip joint, and this joint prevents any leakage of water from the water jacket. The expansion of the cylinder takes place in a downward direction.

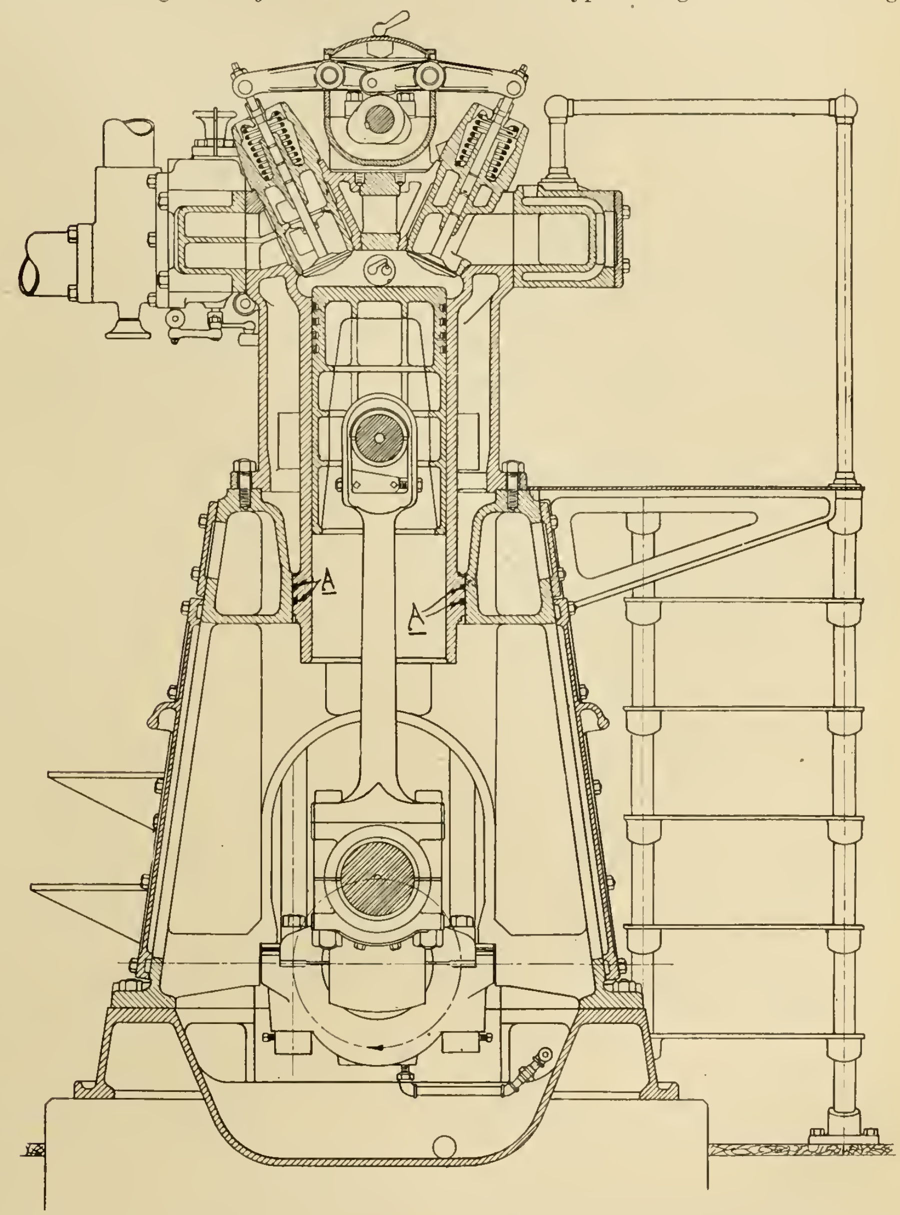

Fig. 1—Cross-section of Warren Vertical Engine.

The cylinder wall of the engine is lubricated by force feed instead of the usual splash and gravity systems. The main bearings and the cam shaft bearings are ring oiling. The wrist pin bearing is lubricated through the medium of a tube, fitted with a ball check valve, as shown at C, Fig. 2. This tube on the

downward stroke of the piston enters the oil receptacle shown, and the oil is forced to the wrist pin bearing.

This bearing is a good deal larger than is common, and is readily adjusted as can be seen at D, Fig. 2.

There are a few other features worthy of note. The crank case forms the outer wall of the water jacket at the lower portion of the cylinder, and thus providing effectual cooling for the cylinder at the lowest portion of the stroke. The point of ignition can be varied while the engine is operating. The method of governing, and the construction of the valves in cages, the location of the cam set on the top of the cylinder, where it is readily accessible, are features of up-to-date gas engine practice.

In conjunction with this engine is the Warren automatic suction gas producer, which is designed and has operated on all kinds of fuels. The features of this gas plant is the flash boiler, the preheating of the air, the 9-inch thickness of firebrick lining in the producer, the rotary grate and the method taking the gas from the producer. An elbow projects down into the fuel, thus preventing any dust from fresh charges getting into the gas. This elbow can be replaced easily and cheaply, when burned out.

This engine and plant is made by the Struthers-Wells Co., Warren, Pa. W. H. Oliver & Co., McKinnon Bldg., Toronto, have the sole Canadian agency.

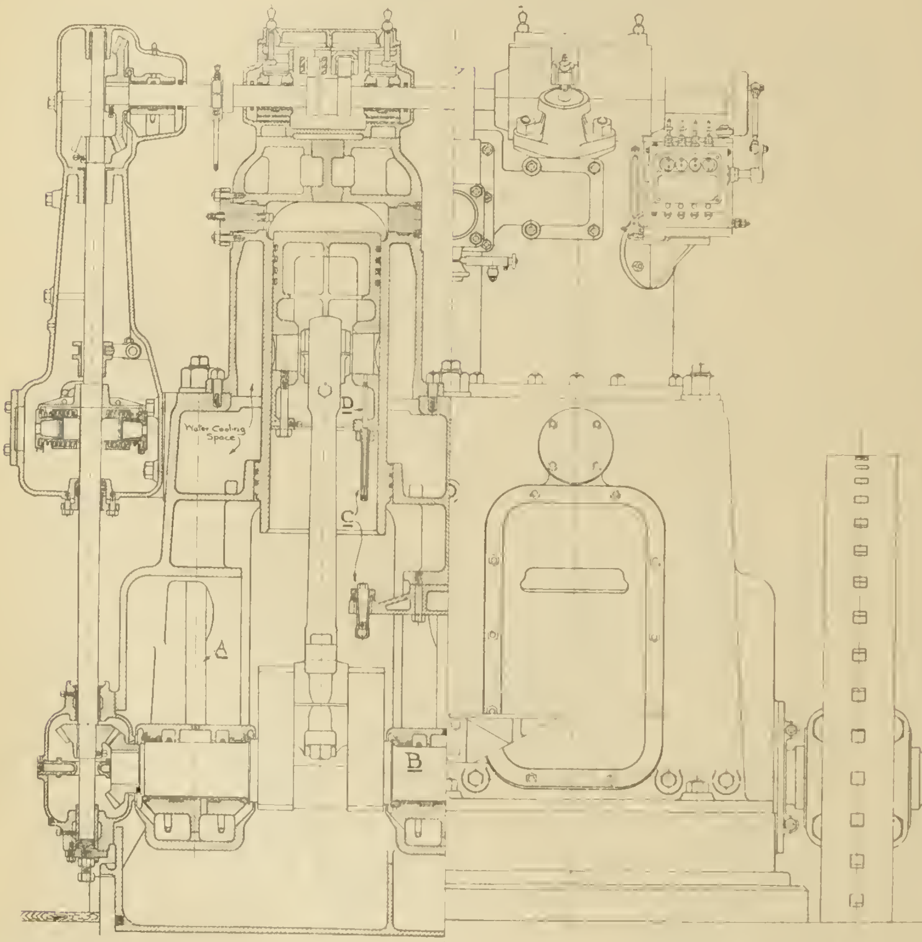
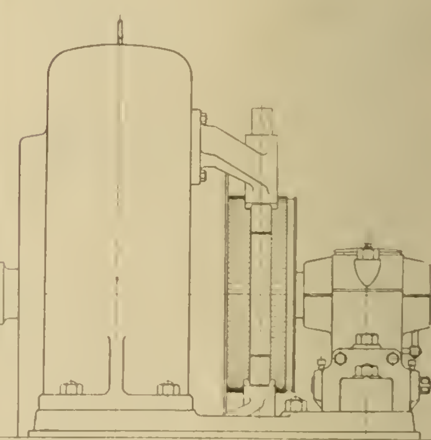

Fig. 2—Cross-section of Warren Vertical Engine.

GISHOLT DOUBLE EMERY GRINDER.

The Gisholt double emery grinder, shown in accompanying illustration, represents one of the latest machines brought out by Gisholt Machine Company, Madison, Wis. This machine is enclosed as much as is possible with a grinder of this type, and is supplied with a fan water pump and large water reservoir, thus insuring an abundant supply of water. The water nozzle, instead of being in the usual position on the upper side of the work rest, is in the back or wheel side of the work rest on this machine, thus the water instead of coming from a nozzle directly over the wheel and rest follows the wheel and comes around in a fine spray meeting work and emery wheel at point of contact; thus the work is always in plain view. This method of water supply does away very largely with splashing and is a material assistance in keeping dry the floor about the machine.

In addition to this the machine has a large water pan so flared on the sides and front that a piece of work up to 14 inches in length comes entirely within the pan, and, therefore, any drip from it will go directly into the pan,

Gisholt Double Emery Grinder.

from which it drains into the tank, instead of going onto the floor.

The machine is supplied with two $1\frac{1}{2}$-inch face by 14-inch diameter emery wheels, mounted on a spindle running in adjustable self-oiling boxes. Furthermore, any end play in the spindle may be very easily and effectually taken up by adjusting two screws in face of spindle driving pulley. Machine is supplied either belt or motor driven.

The spindle pulley is so protected that the belt is kept entirely shielded from water and emery, thus materially increasing the life of the belt. This machine is very heavy and was originally designed by this company for its own use.

INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News.

Machine Shop and Foundry News.

Ulric Desrosiers, machinist St. Damase, Que., has assigned.

Fire destroyed the Canadian Foundry, Montreal, on July 10. Loss $4,000.

Willis MacPherson has opened a foundry and machine shop at St. Mary's Ferry, N.B.

The Dominion Rock Drill and Foundry Co., has increased its capital stock to $40,000

The new molding firm of Galbraith & Johnson, Lindsay, made their first cast July 3.

P. Taylor is building a machine shop at Asquith, Sask., and instaling new machinery.

The Port Perry, Ont., Foundry Co., has been compelled to assign, owing to trade depression.

The Victoria Machinery Depot will instal the latest types of machinery in their reconstructed machine shop.

The C.P.R. has placed an order for 20 freight locomotives with the Locomotive and Machine Co., Montreal.

The Hunter Bridge & Boiler Co., Kincardine, Ont., are asking the town for a loan of $25,000 for twenty years.

M. O'Keefe, Chesterville, Ont., has installed a new cupola, which is larger and more up-to-date than the one formerly in use.

The M. F. Beach Co., furniture manufacturers, Winchester, Ont., have purchased the factory of the Cornwall Furniture Co., Cornwall, Ont.

J. H. Hall & Sons, Brantford, Ont., have secured a site near the Hampel Box Company on which they propose to erect a machine shop.

Howard & Cohen, stove manufacturers, Morrisburg, are negotiating with the Sherbrooke city council with a view to locating their works there.

The plant of the Canadian Iron & Foundry Co., at Three Rivers, Que., escaped the big conflagration which wiped out the greater part of that place.

T. J. Johnston and Sam Galbraith have taken over the molding shop at McCrae's foundry, Lindsay, and will make a specialty of casting plow points.

Chadwick Bros., Hamilton have added equipment to their plant, and are now in a position to manufacture all kinds of special dies, tools, patterns and special machinery.

One hundred and eighty-two employes of the Canadian Iron and Foundry Company, Three Rivers, Que., are on strike. They have not been paid for four weeks it is said.

The Toronto Bolt and Forging Company has closed down its works in Gananoque for a month or more on account of lack of orders, and their wareroom being overstocked.

The Belleville Iron and Horseshoe Co., Ltd., has purchased the rolling mills formerly run by the Toronto and Belleville Rolling Mills, Ltd., and more recently by J. W. Wardrope.

J. E. Lindsay, Gananoque, Ont., has just completed his new machine shop on South St., at the foot of Charles. Mr. Lindsay makes marine engines and reports business very good.

H. C. Patterson, who has severed his connection with the Vulcan Boiler Works, New Westminster, is commencing business on his own account. He will start a new boiler works.

Eatere Rheaume, of the G. Rheaume Foundry Company, Montreal, is at North Sydney, instaling machinery at Thompson's Iron Foundry, for the manufacture of cast iron soil pipe, and fillings.

The factory building in Iroquois, Ont., formerly occupied by the Iroquois Machine Co., has been purchased by the Dundas Linen Mills Co. They are instaling a full line of machinery and expect to soon be running. The power used will be electric.

The Johnston Foundry Co., Kemptville, Ont., have just completed alterations to their foundry and have fitted up a showroom and office in the main building. This firm manufactures a full line of stoves and ranges, besides doing general jobbing work.

Walter G. Morey and Chas. Morey, Boston, Mass., and Howard Parker, Nashua, N.H., have organized the Sherbrooke Machinery Co., the Canadian branch of the Improved Paper Machinery Co., of Nashua, to which the city recently voted a bonus. Work on the construction of the shops has already begun.

The Montreal Pipe Foundry Company, Londonderry, is now engaged on a big contract for the Nova Scotia Steel Company. They will manufacture the molds in which to cast steel ingots. The Pipe Company is building an addition to their plant, and will soon give employment to forty more men, making a total of 140 at the works.

News of Electrical Undertakings.

The Saraguay Electric Co. is seeking permission to enter Montreal.

Considerable extensions are planned by the Molesworth, Ont., Telephone Co.

Westmount, Que., expects its lighting plant will yield $12,000 revenue this year.

The Bell Telephone Co. have started putting wires underground at Sherbrooke, Que.

Edmonton will sell its civic telephone plant to the Provincial Government for $1,000.

The B. C. Electric Company is looking over several water powers in British Columbia.

The B. C. Electric Railway Co. is instaling an electric light system at Chilliwack, B.C.

The Bell Telephone Co. refused Fort William's offer to buy out the company's plant there.

A power house for the Prince Edward Island Railway will be erected at Charlottetown, P. E.I.

James Bros., Kelowna, are sizing up the proposition of instaling an electric lighting plant in Penticton.

The Central Electric Co.'s plant at Portage la Prairie, Man., will instal $30,000 worth of new machinery.

St. Catharines wants a new contract with the Cataract Power Co., as they think $72.50 per lamp too high.

The annual picnic of the Canadian Westinghouse Co.'s employes was held at Niagara Falls on July 11.

Lindsay, Ont., is contemplating instaling electric pumps at its waterworks to replace steam pumps now there.

The St. Lawrence Power Company have been unable to get a charter to dam the St. Lawrence near Cornwall, Ont.

The Maitland River Power Co. is planning to construct a power plant at Black Hole, three miles from Goderich, Ont.

A special committee have been appointed to consider the proposition to erect an electric light station in Sydney, N.S.

Fort William is protesting to the Dominion Government against the Dominion Power Co. being allowed to enter that city.

Ladysmith, B.C., ratepayers have passed a by-law authorizing the borrowing of $25,000 for instaling an electric light system.

The ratepayers of Streetsville, Ont., have carried a by-law to raise an extra $7,000 for the electric light and power plant.

The Western Saskatchewan Telephone Co. are making arrangements to build a line between Drinkwater, Sask., and Belle Plain.

A rural municipal telephone system will probably be instaled at Treherne, Man., by the South Norfolk council at an early date.

Berlin has signed a contract now with the Hydro-Electric Power Commission for 1,000 h.p. The price Berlin will pay is $24 per h.p.

The B. C. Electric Railway Co., Victoria, B. C., are considering the bringing of electricity from the main land across the Gulf of Georgia.

The Alberta Government is instaling the Strowger automatic telephone system in Strathcona, and it will be in operation by September.

The New Brunswick Telephone Co., Fredericton, N.B., are considering the extension of their line from Prince William to Harvey Station.

The Toronto Electric Light Co. has rigged up its old steam plant as a reserve force, as Niagara Falls power cannot be absolutely relied upon.

Westmount is competing, through its municipal steam power plant, with the Montreal Light and Power Co., in the supply of electricity.

Montreal proposes to spend $5,000,000 on the construction of underground conduits in which all electric light, telephone and telegraph wires will be placed.

The town of Merritton, Ont., is going to reconstruct the electric light plant. K. L. Aitken, E.E., of Toronto, has been appointed consulting engineer.

Stratford, Ont., city council has decided to submit another by-law to make a contract with the Hydro-Electric Power Commission for electrical energy.

The Toronto Niagara Power Co. are after the right to erect poles and sell power in West Toronto. The council is not much in favor of granting any rights.

M. K. Rogers, Vancouver, is about to erect a $40,000 power plant in connection with the development of the Hidden Creek group, located at Goose Bay, Observatory Inlet.

A new electric light plant is needed badly in Wingham, Ont. The council have so far decided nothing definite on the question, but there is considerable agitation for a new plant.

The city council of Brantford on July 18 decided to expropriate the plant of the Western Counties Power Co., which is controlled by the Cataract Power Co. The price will be arbitrated.

Geo. L. Clayton, Seattle, Wash., located a water power capable of developing 5,000 horse-power at Ketchikan, B.C., which will be used to furnish electrical energy to the new cold storage plant there.

The Canadian Underwrifers' Association have recommended that the fire alarm system in Toronto, which is now operated on a single circuit, should be divided into sections, each on an independent circuit.

The Colonial Coal Company has purchased the coal property adjoining the Nova Scotia Steel & Coal Company's areas as Little Bras d'Or, N.S., and will instal electric machinery for haulage and mining.

A meeting was recently held at Napinka, Man., to arrange for the construction of a municipal telephone system throughout the municipality of Brenda. The proposed system will cost about $35,000.

The Blenheim and South Harwich Telephone Co. will seek an entrance to Chatham, Ont. The Bell Company's franchise expires this year, and the new concern promises to cut off $10 a 'phone and to place its wires underground.

Hon. Adam Beck says that it is plain from the 27 tenders submitted for the construction of the Government transmission line that it can be built for 10 per cent. less than the Hydro-Electric Power Commission's estimate.

In course of construction at the General Electric Co.'s plant at Schenectady, N.Y., are four steam turbine generators of 20,000 h.p. each, the largest ever built. Two of these are for the Chicago Edison Co. and two for the New York Edison Co.

At a recent meeting of the ratepayers of the municipality of Argyle, Sask., it was decided to make arrangements for the construction of a municipal telephone system. Tenders for the construction of the lines will be called for at once.

Excavation for the new power house at Edmonton has been completed and the city will in the near future call for tenders for the erection of the building, which it is estimated will cost $13,000. The gas producer plant will be instaled by the Allis-Chalmers Company.

Burroughs Falls, near Sherbrooke, Que., have been sold to a syndicate who will build a factory for manufacturing carbide. They are also negotiating with parties at Boynton for the purchase of the water power in that place, with a view to establishing an electric light plant there.

The British Insulated & Helsby Cables, Ltd., Montreal, have just closed a contract with the Montreal Light, Heat & Power Company to supply and instal about $50,000 worth of extra high tension three-core cable, the work to

be completed so as to enable the mains to be used this fall.

The Yarmouth Street Railway Co., Yarmouth, N.S., are developing a water power 15 miles from the town, from which they are certain of getting 500 h.p. the year round. The company are also extending the street railway to Murphy's Bridge. They are, too, putting in a commercial electric lighting system.

The Canadian Independent Telephone Co., Toronto, has made a shipment of automatic telephone equipment to Lyons, France, to form a commercial exchange of the Lorimer automatic telephone system. The equipment was made at the factory of the Canadian Machine Telephone Co., Duncan St., Toronto.

A new electric power company that is to take in Shelburne, Orangeville, Grand Valley and Arthur, Ont., to be capitalized at $100,000, is talked of, and active operations on the work of power development, etc., will be commenced shortly. It is proposed to develop the Huxtable power at Horning's Mills for both lighting and power purposes.

Cecil B. Smith, upon his return from Winnipeg early in July, said: "I am well advised that the city council are about to advertise for the sale of power bonds, and there appears to be little doubt but that a contract for the construction of all the various works, in connection with this enterprise, will be called for and let in the immediate future."

At their meeting on July 14, the city council of Chatham, Ont., laid over the matter of accepting the electric light plant which has been instaled at the local civic building by the Colonial Engineering Company, of Montreal. Charges have been made that the company did not live up to their agreement, and that they did not follow the specifications which they laid before the city when the agreement was drawn up.

Mayor Paterson, of Galt, refuses to sign the agreement between the town and the Hydro-Electric Power Commission in its present form. He declares that he has no authority to do so, in view of the fact that the agreement makes the ratepayers liable for any amount over $22 per horse-power which the carrying out of the work may cost. Although the majority of the council have sanctioned the signing of the agreement, the mayor says he will not do so unless it is demanded by popular vote, the people having last January approved of taking power at $22 per horse-power or less.

Saw and Planing Mill News.

J. A. Gregory is building a new sawmill on the Lepreaux River, N.B.

The sawmill of O. Brouillard, Carmel, Que., has been destroyed by fire.

The sawmill of John Walter, Strathcona, Alta., was damaged by fire recently.

John Carew, Lindsay, will erect a planing mill there to replace the mill recently burned.

The saw, planing and shingle mill of Duff & Stewart, Bluevale, Ont., was burned. Loss, $3,000.

Brooks, Scanlon & Co., Minneapolis, Minn., will erect a $300,000 lumber mill near Vancouver.

The Moose Jaw, Sask., Lumber and Supply Co. has been sold to the Lesster W. David Co., Vancouver.

Walker & Son have started a factory at Rosthern, Sask., for the manufacture of sashes and doors.

Ferdinand Gratton's sawmill, North Bay, Ont., was destroyed by fire. Loss about $1,500, principally on machinery.

Peterboro county council has decided to erect two new bridges this year—one at Norwood and the other at North River.

The sawmill of P. Kyle, Merrickville, Ont., G. J. Brumwell's sawmill, Lindsay, Ont., was burned on July 10. Loss, $5,00.

Street Bros.' sawmill at Chilliwack, B. C., sustained some loss during a recent fire. was destroyed by fire. Loss, about $5,000.

The Lindsay, Ont., Planing Mill, recently burned, has been rebuilt, and a new and additional mill is being erected at Haliburton.

The Mount Royal Box and Lumber Manufacturing Company, Montreal; was destroyed by fire, and damage estimated at $10,000 was done.

E. J. Young, Madison, Wis., and F. N. Norton, Medford, Wis., will erect a sawmill for domestic and export markets on the Indian River, B.C.

Beckler & Company's sawmill, Somb'ra, Ont., was burned to the ground on July 12. The loss is about six thousand dollars, partly covered by insurance.

The Fraser River Sawmills, New Westminster, said to be the largest sawmills in the world, are rapidly being completed. The mill will require an outlay of over half a million dollars.

E. J. Skeans, of Vancouver, has completed arrangements for the erection of a large sawmill on the Alberni canal, to be in operation this coming fall. The mill will have an initial capacity of 75,000 feet per ten hours. Estimated cost of plant, $75,000.

A disastrous fire occurred in the Adolph Lumber Mills, Bane's Lake, south of Elko, Alta. All the machinery and mill total loss. Lumber saved. This was one of the busiest, best-equipped mills in the district, and the machinery was nearly all new. Valued at $30,000, fully covered by insurance.

One of the most disastrous fires in the history of the Ottawa valley has devastated a large area of valuable spruce and pine timber limits along Lake Nipissing and the Montreal River. Among the losers are Messrs. J. R. Booth, the Shepard & Morse Company and Gillies Bros., and it is stated that nearly one hundred and fifty million feet of timber have been destroyed.

The utilization of waste timber is being brought to the fore in the operations of the B.C. Wood Pulp and Paper Company, of Vancouver. T. R. Nickson & Company, contractors, shipped supplies to Port Mellon, and sent up thirty men to start work on the foundations of the huge structures that are to be erected. Work will be rushed, and it is expected that by fall the machinery will be in place, and production almost started.

A syndicate composed of railroad men and capitalists of the middle western States, has closed what is perhaps the largest single timber land transaction made in British Columbia. It consists of 49 square miles of timber limits in the centre of Graham Island, 40 square miles of Moresby Island, and an outright purchase of 8,000 acres of the choicest crown grant lands in Graham Island. The investment reaches several millions of dollars, the initial payment being $250,000. The syndicate, which is to be known as the Moresby Island Lumber Company, will erect a sawmill, to cost $100,000, on Cumshewa Inlet on Graham Island.

Railroad News.

The C.P.R. will double-track the Hull street railway system.

The Hamilton Street Ry. Co. will put on 25 new double-truck cars.

The Ottawa electric railway will be extended to the Experimental Farm.

Work on the Brockville-Ottawa electric railway will be begun in September.

American capitalists purpose building an electric railway between Belleville and Shannonville, nine miles.

Hon. G. P. Graham stated in the House recently that the line to Hudson Bay would be constructed without delay.

A suburban service on the C.P.R. between Toronto and Myrtle, 28 miles east of Toronto, is being proposed and advocated.

The Canadian Northern Railway has purchased the factory site of the Evans Co., at Sudbury, for railway purposes.

The B. C. Electric Railway Company has completed arrangements for the equipping of all the Vancouver cars with air brakes.

The C.P.R. are negotiating for the purchase of the Minto coal mines in Queen's county, N. S. This coal is considered excellent for steam.

The contract for the Goderich section of the Ontario West Shore Electric Railway has been awarded to the Huron Construction Company.

Steel has been laid on the T. & N. O. 218 miles above North Bay and within 30 miles of the junction with the National Transcontinental.

New 80-lb. steel rails are being put in on the Quebec Central Railway, between Sherbrooke and Quebec, to replace the lighter rails now in use.

Construction work on the Southern Counties Electric Railway between St. Lambert, Longueil and Montreal, will be commenced at once.

The B. C. Electric Railway Co., Vancouver, have turned out three new cars monthly during the past three months, and have orders for ten more cars.

The contract for the first section of the Westminster-Chilliwack electric car line has been awarded to Boyd & Craig, of Vancouver. Approximate cost $100,000.

The Great Northern are reported to be considering the construction of a railroad from Winnipeg to Calgary and through northern Saskatchewan and Alberta.

A by-law is being prepared to enable the Brantford Street Railway Company to extend their tracks from Mohawk Park to the T. H. & B. bridge at Cainsville.

J. D. McArthur & Co., Winnipeg, have been awarded the contract for the extension of the C.P.R. from Moose Jaw to the new townsite of Outlook, 123 miles distant.

Construction work will soon be commenced on the O. M. Railway to complete the line from Masonville, Que., to North Troy, connecting with the C.P.R. at that point.

On July 1 the C.P.R. opened three branches in Ontario—Linwood to Listowel, 16 miles; Saugeen Junction to Hanover, 27 miles, and Embro to St. Mary's, 18 miles.

Port Arthur and Fort William have entered into an agreement whereby Port Arthur will operate the Fort William end of the street railway for the next five years.

The bonds of the Canadian Northern for construction work in Manitoba and Saskatchewan have been guaranteed by the Dominion Government to the extent of $13,000 per mile for 609 miles.

The surveyed route of the Mount McKay & Kakabeka Falls Railway follows the mail road from this city to Kakabeka Falls, about fifteen miles. The track will be laid with eighty-pound steel.

The new subsidies voted by the Government provide for 141 miles of railway in Nova Scotia, 155 miles in New Brunswick, 520 in Quebec, 5 0 in Ontario, 165 in Alberta, 123 in Saskatchewan, 35 in Manitoba and 665 in British Columbia.

Application for charter will be made to the Legislature by the Morrisburg, Ont., Electric Railway Company, who plan the construction of an electric railway through Williamsburg, Winchester, Chesterville and Morewood, to Russell.

The Dalmeny to Carlton branch of the C.N.R is just about completed and the grading outfit has been ordered to start work on the C.N.R. extension to Battleford through the Shellbrook district. This line will be continued through to Calgary.

The G.T.P. will build a half-million-dollar viaduct across the Salmon River at Grand Falls N.B. This will be one of the heaviest structures on the whole system. Two other bridges will be built by the same company in New Brunswick.

Owing to the death of Sir Robt. Reid, president and manager of the Reid Newfoundland Railway, this railway will be sold. Rumor has it that it will be absorbed by the C.P.R., Sir Thomas Shaughnessy being a director of the company.

The C.P.R. are endeavoring to secure running rights over the I.C.R. from St. John to Halifax. Competent railway men think that a fair agreement would result in good to the I. C.R., and to Halifax from the resultant increase of trade.

The Vancouver Island Eastern Railway Company, organized last year to build an electric railway from Esquimalt Harbor, Vancouver Island, north to Seymour's Narrows, and from Bute Inlet or Frederick Pass to Edmonton, are applying for a charter.

The Westmoreland Power Company have applied to the Legislature for a charter. Among the privileges asked for is the right to construct and operate electric railways in the city of Moncton, N.B., and through the counties of Westmoreland, Kent and Albert.

The Dominion Government re-voted subsidies to twenty-six railways, aggregating 1,678 miles; and voted new subsidies to forty-four roads aggregating 2,150 miles. If these subsidies are earned they will amount to about $5,000,000 on the re-votes and $6,000,000 for new work.

The prospects of work being started on the Hamilton, Waterloo and Guelph Railway are bright. Although not very successful with Old Country financiers, John Patterson and his associates think they now have a good chance of getting the money at once for the construction of the line.

The B. C. Electric Co. has ordered $375,000 of rails in the Old Country and the first shipment of 2,000 tons of 70-lb. rails is expected to arrive about October. The first section of line, 12 miles, from New Westminster to Cloverdale, is expected to be open before the close of the year.

The Canadian Northern are proceeding with construction work on their line from Regina through the Fairvale and Cottonwood districts. The road will also be continued through to Calgary this season if the Governments of Saskatchewan and Alberta will guarantee the bonds for the work.

The C.P.R. are replacing the present rails of their line between London and Detroit w heavy 80 pound steel. The work will be extended over two or three seasons, and each year a certain portion of the present line will be thus improved. This year the section between Ilder Park and Caradoc is being relaid.

The Dominion Government have assumed the entire assets and franchise of the Quebec Rail

way and Bridge Co., and the whole undertaking of reconstructing the bridge has been placed in the hands of the Transcontinental Railway Commission, who will engage the best engineering talent obtainable.

Railway construction at present going on in Ontario includes the C.P.R. Peterboro to Victoria Harbor branch, and double tracking Midland Division G.T.R. between Midland and Port Hope, 150 miles. A projected line is a 30-mile branch to be built by the James Bay Railway (C.N.O.) from Orillia to some point on the Georgian Bay.

E. Hoffman, New York city, is at the head of a Canadian syndicate which purposes building a railway from the American boundary to the southeast of Cardston, Alta., to Dawson City. The company, which will be known as the Northern Empire Railway Company, is seeking permission to bond the railway to the extent of $30,000 per mile. It is expected that preliminary surveys will be started at once.

The Canadian Pacific Railway will build a line from Sarnia to Komoka next spring. The line will run north of the present tunnel branch of the Grand Trunk. Trains will be ferried across the St. Clair river between Port Huron and Sarnia, unless arrangements can be made with the Port Huron Tunnel Company, which is under Grand Trunk control. This line will enable the Canadian Pacific to enter Chicago over the Pere Marquette, and will reduce the mileage from Montreal to that city.

The C.P.R. has decided to found Y. M. C. A. branches in connection with the divisional points, one at Chapleau and the other at Schreiber—divisional points on the main line north of Lake Superior. The new branches, which are the first that have been organized on the C.P.R. eastern lines, will be conducted on principles similar to those of the G.T.R. The work in view will not only be religious and social, but largely educational and of a character that will be appreciated by the mechanics and others in the construction and operative departments.

The Minister of Railways brought down the report of the Georgian Bay Canal survey to the House on July 6. A close computation gives about 70 hours as the time of transit from the Georgian Bay to Montreal, about two days faster than any other existing water route to the sea. Of the 440 miles constituting the waterway, 108 miles will require excavation work for locks, approaches, canals, submerged channels, etc., leaving 332 miles of natural river or lake channels which will not require any improving beyond the raising of the water surface. The cost is estimated at ten millions a year for ten years.

The proposed extensions of the Canadian Northern Railway in Saskatchewan and Manitoba include a line from Regina to the western boundary of Manitoba, there connecting with the company's line to Brandon, not exceeding 152 miles; from Saskatoon towards Calgary, not exceeding 175 miles; from Prince Albert to Battleford not exceeding 132 miles; from the Thunder Hill line of the company's railway at the westerly boundary of Manitoba, in a western direction towards Rosthern, not exceeding 100 miles; an extension of the Rosthern line from the western boundary of Manitoba in a northwesterly direction, not exceeding 50 miles.

Following are the new railway subsidies granted by the Dominion Government for Ontario: To Erie, London and Tillsonburg Railway Company, for a line of railway from Port Burwell to London, 35 miles; Nipissing Central Railway Company for a line from New Liskeard on the Temiskaming & Northern Ontario Railway to a point in the township of Guigues in Quebec, 13 miles; St. Mary's & Western Ontario Railway Company, for a line from Woodstock to Exeter, 45 miles; Burk's Falls & French River Railway Company, for a line from Burk's Falls to French River, 85 miles; Thessalon & Northern Railway Company, for a line from Thessalon northerly, 4 miles; Canadian Northern Ontario Railway Company, for a line from Sudbury Junction to Hutton Mines, 30 miles.

General Manufacturing News.

The MacLean Separator Co., Sarnia, propose locating in St. Thomas.

The Silver Queen mine power house, Cobalt, was burned on July 12. Loss $20,000.

The Cliff Brick Co.'s plant at Medicine Hat was destroyed by fire. Loss $60,000.

The Dominion Copper Co., Boundary Falls, B.C., have resumed operations this week.

C. W. Shideler, Fruitvale, B.C., has begun the manufacture of brooms at that place.

C. Wilson & Son's scale works, Toronto, had $16,000 damage done their premises by fire recently.

W. H. Hutchison is refitting his old mill at Prince Albert with new machinery for sawing shingles.

The new manufacturing plant of the Siche Gas Co., in Georgetown, Ont., is just about completed.

A factory for the manufacture of corrugated iron pipe is to be erected in Stratford this summer.

The American Copper Company is endeavoring to secure the copper mines in Albert County, N.B.

The Canada Paper Company, Toronto, will in all probability make extensive alterations to two of its mills.

The large abattoir of Gordon, Ironsides & Fares, Winnipeg, was destroyed by fire recently. Loss about $50,000.

A powder factory for making explosives to be used on G.T.P. railway construction work will be built at Prince Rupert.

A quarter of a million dollars are being spent on improvements in the Granby copper mines in British Columbia.

The Siche Gas Co. has opened its new factory at Georgetown, where machinery for making gas will be manufactured.

The Canadian Consolidated Gold Dredging Co., Vancouver, B.C., is placing orders for four new dredges, to cost $460,000.

Plans are under way by the Imperial Wall Paper Co., Glen's Falls, N.Y., for the establishment of a large factory in Montreal.

On July 6 the ratepayers of Port Ronan, Ont., voted on and carried a by-law to loan $3,000 to the Caldwell Bit and Tool Co.

Jos. T. Gilman, of the Goodwin Car Company, New York, recently stated that his company were considering locating in Winnipeg.

The recently formed Brass & Steel Goods Co. has passed a by-law changing the head office of the company from Toronto to Belleville.

Peterboro is after a Yorkshire, Eng., manufacturer, who contemplates erecting a brickmaking and grinding machinery works in Canada.

An American lumber concern is looking for a site at Blaine, B.C., on which to locate a large mill in order to compete in the Canadian market.

The Consolidated Mining and Smelting Co., Trail, B.C., is shipping 15 cars of high grade matte per month. A recent carload was valued at $32,000.

R. C. Jamieson & Co. has purchased the plant of P. D. Dods, Montreal, and are now in possession. J. H. Morin has purchased the Toronto business.

The Northern Iron and Steel Corporation, with United States capital, intend establishing a plant to employ 1,000 men, on the British Columbia coast.

Joseph Rodgers & Sons, Sheffield, England, are considering the advisability of establishing a branch house in Vancouver in order to look after western business.

The Inglewood Pulp Company, St. John, N. B., have begun the work of loading their cribs with blocks for the Mispec mill, which is about to begin operations.

Frank Reardon, J. A. Watt, C. E. Silliker and G. R. Ramey are negotiating with the council of Halifax, with a view to establishing a glass works in that city.

The Fernie, B.C., Brick Co., a recently-formed concern, is about ready to start operations at its new plant. The plant will be able to turn out 30,000 bricks a day.

An incendiary fire damaged Armstrong & Co.'s flour and feed store and Frost & Wood's agricultural implement branch store at Wallaceburg to the extent of $8,000.

The Joliet, Ill., match factory will locate a plant for the manufacture of wood splints at Ericsburg, on the borders of Canada and the United States, near Fort Frances.

The Hydraulic Supply Mfg. Co., Seattle, will build a branch plant in Victoria, if it secures the contract for 18,000 feet of steel-riveted pipe required for the new waterworks system there.

The Peterboro Lubricator & Mfg. Co., to manufacture greased cups for lubricating purposes, is a new concern recently formed among Peterboro business men. M. W. Boerema is the manager.

W. Theobold, representing the Peterboro Show Case Company, will begin in two weeks' time to manufacture show cases. He will also look after store fixtures, cabinet work, upholstering and picture framing.

By a vote of 282 to 9 the by law granting free water and exemption from taxation for ten years to the William Smith Company, of Chesley, Ont., manufacturers of church and lodge furniture, was carried.

The new $50,000 fish-freezing plant of the British Columbia Packers' Association at New Westminster, has been finished. It has a capacity of 30 tons of fish daily.

The Holmes Safety Blasting Compound Co., now forming to manufacture the new explosive discovered by J. E. Holmes, Haliburton, propose locating either at Lindsay or Toronto. The company will be capitalized at $500,000.

It appears that natural gas is being found in considerable quantity near Woodstock. The first well sunk yielded such good returns that another is being sunk. It is expected that gas will be sold at from 25c to 35c per thousand.

The Brant Portland Cement Company, St. Mary's, Ont., capitalized at $500,000, has secured an option on fifty acres of property there with a view to the establishment of a plant with an initial capacity of 800 barrels per day.

It is learned that the extensive coal interests controlled by Hon. James Dunsmuir, on Vancouver Island, will pass into the hands of New York capitalists, of whom Luke Wishart is one. The amount involved is said to be about $5,000,000.

The Western Fuel Company, at Nanaimo, has under way improvements that will cost in the neighborhood of $50,000. A new ventilating fan at the Northfield mine will cost $12,000, a high type fan another $25,000, and a Baldwin locomotive $12,000.

Another big factory is in sight for Chatham, Ont. Representatives of a Detroit concern which contemplates starting a branch factory there, were in the city last week looking over the ground. The concern will, if it locates there, employ 100 hands.

The Hamilton Tar & Ammonia Company, which was recently incorporated, has purchased a block of land bounded by Sheaffe, Bay and Caroline Streets, on which it intends to establish a large plant for the manufacture of tar and ammonia products.

The Edmonton Cement Company is negotiating with the town council of Red Deer, Alta., regarding the establishing of a cement works on the river banks near the electric power house. The company proposes to instal a plant which will employ ten men.

R. H. Fulton, of Montreal, has in view the establishment of a turpentine factory on Vancouver Island, securing his raw material from the timbered lands which the C.P.R. will clear there for agricultural purposes along its extension to the west coast.

Engineers are at Phoenix, B.C., to lay out the site of the extensive tunnel project to be driven by the Greenwood-Phoenix Tunnel Co., which will be incorporated with a capital of $5,000,000. It is expected that actual operations will be commenced in the near future.

The first steel boat ever built by private enterprise in Nova Scotia has just been turned out of the shipyards of J. W. Carmichael & Co., New Glasgow, N.S. Most of the material entering into the construction of this boat was made in Nova Scotia, and the rest was imported from Great Britain.

The Tilbury, Ont., handle factory is reported very busy, and the proprietor, W. C. Crawford, states that it will be necessary to increase the capacity of the plant. It is claimed that raw material can be purchased and shipped from Alabama more cheaply than it can be purchased in this peninsula.

A special meeting of the shareholders of the New Brunswick Petroleum Co. will be held for the purpose of considering a proposition made by an English syndicate to purchase the oil wells in Westmoreland county. It is expected the deal will go through and that the properties will be developed on a large scale.

Negotiations have been going on for some time, and are now reaching what is believed will be a satisfactory conclusion, for the granting by the Canadian Government of a yearly bonus of 3 per cent. for 20 years upon the cost of the proposed drydock at the Bridgeburg yards of the Canadian Shipbuilding Co.

Waterworks and Sewerage News.

A $7,500 sewerage system is proposed for Mimico Industrial School.

Norwich, Ont., will construct between 3,500 and 4,000 feet of sewers.

Elmira, Ont., may spend $25,000 for the extension of the waterworks.

Regina is looking for authority to spend $50,0000 for waterworks extensions.

A general sewerage system is proposed to be constructed in Stadacona and Lairet Wards, Montreal.

West Toronto is considering a proposition of the Artesian Water Co. to supply that city with water.

Victoria, B.C., is considering the installation of a more complete system of surface drains for the city.

Galt ratepayers will vote on a by-law to issue $50,000 for the purposr of constructing a sewerage system.

North Toronto will submit plans and estimates to the council for a filtration bed for the waterworks station.

Fort William will on August 5 vote on a by-law to raise $95,000 to extend the Loch Lomond waterworks.

Arcola, Sask., ratepayers have again passed the by-law to complete the construction of that town's waterworks scheme.

St. Louis, Que., council will submit a by-law to the ratepayess for the purpose of laying water pipes to cost $180,000.

Tenders are being asked for the instalation of the waterworks plaut proposed for the penitentiary at Prince Albert, Sask.

The St. Louis, Que., council will submit a by-law to the ratepayers for the purpose of laying water pipes to cost $180,000.

A by-law will be submitted to the ratepayers of Richmond, Ont., authorizing the expenditure of the sum of $20,000 for sewers, etc.

Hintonburg, Ont., is now supplied with water from the Ottawa waterworks. That city has also taken over the Ottawa East waterworks.

The contract for 4,200 feet of cast iron water pipe for the Oak Bay municipality, Victoria, B.C., has been awarded to W. G. Winterburn.

The Ontario Provincial Railway and Municipal Board has confirmed the by-law passed by Port Elgin to raise debentures to the amount of $10,000 for a waterworks system in that town.

A sedimentation basin, in connection with the waterworks, will be constructed at Saskatoon, and tenders will soon be called for the work; and a new small engine and generator will be added to the power plant.

The civic waterworks committee, Ottawa, has approved the recommendation of the city engineer for the immediate construction of that section of the new aqueduct which is to be built near Kopeau Bay, at estimated cost of $74,000.

At a meeting of the council of Preston, Ont., the contracts for the various works on the town's system of sewerage were let. The Concrete Engineering & Construction Co., Toronto, were awarded the contract for laying of the sewers, and the Canadian General Electric were awarded the contract for the pumping apparatus.

The Saskatoon board of works are mapping out a plan for the extension of sewer and waterworks. An immense water tower has been built on Nutana hill and pipes are being laid between it and the power house. The supply will have to cross the new traffic bridge, for which brackets and pipes have been ordered.

Plans of Galt & Smith, consulting engineers, Toronto, for a complete sewer system and sewerage disposal works, have been accepted by the Vernon, B.C., council. The general system will consist of about five miles of pipe sewers, sizes 18 to 8 inches diameter, with all the necessary appurtenances. The first will consist of a septic tank, with a continuous filter, and provision will be made for future extensions. Estimated cost $57,500.

Structural Steel Construction News...

It is estimated that the cost of the collapse of the Quebec bridge will be $1,800,000.

Four steel bridges, costing $15,000 in all, will be built by the Ontario Government in northern Ontario.

The city council of St. John, N.B., is considering building a bridge across the harbor at a cost of $13,000.

A steel bridge to cost $61,000 will be built across the north arm of the Fraser River by New Westminster, B.C.

Subsidies amounting to $800,000 for bridges are provided for by the Dominion Government in various parts of Canada.

Peterboro county council has decided to erect two new bridges this year—one at Norwood and the other at North River.

By a vote of 213 to 128 the by-law authorizing the building of a new $61,000 bridge across the north arm of the Fraser has been carried by the New Westminster ratepayers.

A deputation from Fort William, Port Arthur, North Bay, Sault Ste. Marie, Mattawa and various towns of the Ottawa valley urged the Dominion Government to construct the Georgian Bay Canal.

Wallaceburg, Ont., council granted R. L. Pattinson and associates, of Buffalo, a 25-year franchise for supplying natural gas to that town. If the natural gas supply plays out, the franchise is good for artificial gas. Mr. Pattinson expects to be supplying Wallaceburg early next fall.

There is every reason to believe that the citizens of London, Ont., will be enjoying natural gas by the time winter fairly sets in again. A company to lay a pipe from the Port Dover gas field to that city has been organized, and work will be commenced with as little delay as possible. It will take about ninety days to construct the trunk pipe line, about sixty miles in length.

Trade Notes.

The L. S. Starrett Co., makers of fine mechanical tools, Athol, Mass., has opened a warehouse in London, Eng.

The G.T.P. has ordered from the Smart-Turner Co., Hamilton, a 2-ton jib crane for use at Portage la Prairie, Man.

The Northern Engineering Co. has the heating and ventilating contract for the new wing of the McKellar general hospital at Fort William.

The Cutler-Hammer Mfg. Co., Milwaukee, Wis., makers of electric controlling devices, will in future be represented on the Pacific coast by Otis & Squires, San Francisco, Cal.

The Electric Controller & Supply Co., Cleveland, Ohio, has changed its name to the Electric Controller & Mfg. Co., as this more truly indicates the nature of the company's business.

The contract for the new engine for the Montreal fire department was given to the Waterous Engine Co., Brantford. The Eugene F. Phillips Electrical Works, Montreal, will supply the copper wire.

Allis-Chalmers-Bullock, Montreal, has secured the contract to enlarge the Calgary municipal lighting plant, with a 750 k.w. alternating current generator, 30 k.w. exciter, switchboard and other auxiliary apparatus.

The L. Sessenwein Rail and Iron Co. has been registered, and with L. Sessenwein as manager has opened up offices at 182 William St., Montreal. They will deal extensively in steel rails, also old materials.

John F. Allen, 370-372 Gerard Avenue, New York city, reports recent sales of Allen riveting machines to the Eastern Steel Co., Pottsville, Pa.; York Bridge Co., York, Pa.; Delaware Bridge & Iron Co., Delaware, Ohio.

J. Armand Garneau, 88½ St. Patrick Street, Quebec, has secured the Canadian agency of Wilkinson's Mehamo, a powder dissolved in water and sprinkled by syringe or watering can over the coal for decreasing the volume of smoke and increasing the heating power of the fuel.

The Smart-Turner Machine Co., Hamilton, has supplied duplex pumps to Bailes & Son, Cobalt; the Cotton Factory Siding, Halifax; Hamilton Bridge Works, Hamilton; the Lotbiniere Lumber Co., St. Jean Descaillons, Que.; the Northumberland Paper & Electric Co., and L. Meiklejohn, Stirling, Ont.

The Milroy-Harrison Co., machinery supply dealers, have removed from 66 Richmond St. E. to 196 King St. W., Toronto. This firm have added several new agencies to their line and found the move was necessary in order to procure larger warerooms and better facilities for handling their increasing business.

Mr. Weaver, the capable manager of the Dominian Foundry Supply Co., Montreal, the Canadian member of "The Big 3" at the Toronto Foundrymen's Convention, is well pleased with convention. An order for a No. 6 Whiting cupola has been placed with him at the convention by the Jencks Machine Co., St. Catharines. Other sales were core oven and ladles to the Carth Co., Montreal; several barrels of plumbago and other foundry supplies.

The firm of Smith Bros., for the past fifteen years engaged in the molding sand business a few miles north of Albany, N.Y., have transferred their property to the Albany & North River Molding Sand Co., of Albany, N.Y. This is the largest transfer of molding sand property that has occurred in the Albany sand belt in a good many years, comprising over three hundred acres. The transfer includes railway sidings and dock located on the Champlaincanal, which makes a very convenient loading point for sand destined for Montreal and vicinity. Frank P. Smith will continue in charge of this plant for the new owners.

Evidences of Industrial Revival.

The G.T.P. is already calling in its freight cars from the G.T.R. for use in the west.

The Sutherland Rifle Sight Works, at New Glasgow, N.S., is now running and employing fifty hands.

The Hensall, Ont., foundry has made a big contract, which covers a period of three years and may require an increase of staff.

The U. S. crop report is very rosy. The average condition of all grains is ahead of a year ago, and spring wheat is the best crop in ten yeats.

The pulp mills at Sault Ste. Marie is again running full time and with the improvement in the pulp market any fear of a shutdown has disappeared.

Chapple Bros.' Lumber Mills, Sydney River, C.B., has tided over a rather trying time and is now working full time, employing 50 hands and turning out 15,000 feet of lumber per day.

The big smelter at Thorold, Ont., is now busily engaged turning out the finished product from the Coniagas mine at Cobalt. It is likely the smelter may increase its operations.

The big furnace of the Dominion Copper Co.'s smelter at Phoenix, B.C., was blown in at the beginning of July, and is now treating about 500 tons of ore per day. Fifty men are employed.

Western Canadian grain will yield well this year and there is now no doubt that the crop will be large. The season is from two to four weeks earlier than last year, which is a great advantage.

The C.P.R. is taking steps to gather 25,000 men in the east for work in the western wheat fields, where it is said by one of the officials that wages of from two to three dollars a day and board may be obtained.

John McCrae's foundry at Lindsay is a very busy place these days. The men are unusually busy and are rushing out the orders as fast as possible. Mr. McCrae says that business is picking up wonderfully and that they are busier than they have been for some time.

The Dominion Wheel Co., Lindsay, are running again, and report orders coming in faster all the time. It will only be a short time till they are running full time and have all they can do. Their prospects are very bright for a good business this fall.

The general outlook at Londonderry, N.B., is improving and everything is now humming at the mining town. Officials at the rolling mills say that all over the continent the iron trade is improving, and that men are being re-engaged at the half-closed works in large numbers.

Superintendent Coleman, of Montreal, inspected the London Grand Trunk car works, and announced that 50 more men would be taken on and the working hours increased from 45 to 50 hours a week. The present staff of 450 men cannot turn out cars fast enough to meet the demands of traffic.

After being on short time for some weeks, the employes of the McClary Manufacturing Co., London, who number over 700, started work on full time on July 17. All the departments of the firm are now in full swing, and there are prospects of sufficient work ahead to keep the entire establishment busy for some time to come.

All the men in the Canadian Pacific western shops have gone on full time. The hours are now from 7 in the morning until 5.30 in the evening, 9½ hours. This the officials hope, will enable them to get the rolling stock ready for the heavy business which is anticipated this fall. The eight-hour day was put into effect last autumn when business became dull.

A. C. Flumerfelt, president of the International Coal & Coke Company, of Coleman, Alberta, who was in Montreal for a few days, states that the company's 200 coke ovens have been re-opened in consequence of the revival of the copper industry, the International having a contract to deliver coke to both the Dominion and the British Columbia Copper Companies.

Several hundred workmen have been taken on at the Angus shops of the Canadian Pacific Railway within the past few days, and more will be added. The Canadian Pacific is looking for a bumper harvest in the great west, and preparing for the part they will have to play in moving it. A return to prosperity is beginning to show itself in many ways.

Business conditions throughout Nova Scotia are in a very healthy condition and the outlook is most favorable. The weather has been excellent for the crops, and the farmers have already started to cut their hay. All the industrial plants are running full time, and the coal mines are making record outputs. The Dominion Coal Company's output is several thousand tons ahead of that of last year

Building Notes.

A pulp and paper mill is assured for Kenora, Ont.

The Farmers' Milling Co. will build a flour mill at Duck Lake, Sask.

Mr. McKelvey, Stratford, proposes to build a furniture factory in Galt.

John P. McLeod & Sons are erecting a new warehouse at Baddeck, N.S.

An extensive addition to the Kent Canning Works, Chatham, is planned.

The Ottawa Electric Railway will erect a new and additional car barn.

The Hydraulic Supply Mfg. Co., Seattle, will build a branch plant in Victoria.

The Kingston Milling Company, Kingston, will erect an addition to its mill.

The Westrumite Mfg. Co., a new paving concern, will erect a plant in Brantford.

W. J. Meyers, Toronto, will erect a building for the manufacture of brewers' casks.

Wilson Bros. will build an automobile warehouse to hold 100 cars, at Saskatoon.

The Ontario Government will erect a new $30,000 Winter Fair building at Guelph.

A. A. Barthelines will erect a three-storey piano-action factory, to cost $19,000, in Toronto.

The F. H. Rice Lumber Co., St. Louis, Mo., contemplate erecting a $100,000 plant in Victoria, B.C.

The Campbell Lubricating Co., Hamilton, will erect a brick warehouse at a cost of about $3,000.

It is reported that the Dominion Soap Company, Hamilton, will establish a factory in Brantford.

The Willis Piano Co., Montreal, is building a concrete factory to employ 400 men at Ste. Therese, Que.

The Nanton, Alta., Lumber and Grain Company are preparing to build an elevator at Cayley, Alta.

A 1,000-barrel flour mill is proposed to be built at Port Arthur, if that town grants certain concessions.

The new $500,000 Fraser River sawmills being built near New Westminster will be one of the largest mills in the world.

Stockwell, Henderson & Co., Toronto, will in the fall commence the erection of a building estimated to cost $20,000.

C. W. Cornish is erecting a new elevator building at Lakefield, Ont., to take the place of the flour mill recently burned.

ed to commence at once. Although shoe tacks will be the specialty manufactured, the new concern will make all kinds of tacks.

W. H. Phelps, Seattle, and E. F. Satchell, Vancouver, are erecting a $35,000 sawmill on the Skeena River, near Aberdeen, B.C.

Malcolm McIntyre has the contract for the work of erecting the new German Card Board factory for M. A. Turner, at Peterboro.

A $3,800,000 pulp and paper mill is promised to be built at Kenora by a syndicate, if the town grants tax exemption for ten years.

The Gurney Stove Company is making preparations to start in Prince Rupert, and the excavation is now going on for the store.

S. H. C. Miners has given a contract to Keut & Cox for a large modern rubber factory at Granby, Que. It will be in operation a year hence.

The Fernie-Fort Steele Brewing Company have awarded the contract for the erection of a modern $200,000 brewing plant to H. Stanley, of Fernie.

The Expanded Metal Company have been granted a permit to erect a one-storey concrete building in Toronto, at an estimated cost of $20,000.

Tenders have been let and contracts signed for the erection and equipment of a 150-barrel flour mill at Aberdeen, Sask., by the Aberdeen Milling Co.

The Evans Co., Sudbury, will erect a new plant in Sudbury, owing to the Canadian Northern Railway wanting the present site of the factory.

The Northern Iron and Steel Corporation, with United States capital, intend establishing a plant to employ 1,000 men, on the British Columbia coast.

George F. Webb, contractor, is to build a brick addition to the spike mill of the Hamilton Steel & Iron Company, at Irondale, East Hamilton, to cost $1,500.

The Bell's Lake Portland Cement Company, Markdale, capitalized at $450,000, will erect a cement mill at Walter's Creek, Ont., to have an initial capacity of 1,000 barrels per day.

Contractor E. Moriset has the contract for the new workshops to be erected on Bridge Street, Quebec, for F. X. Drolet, at a cost of $50,000. The building will be of brick construction.

A. F. Bemis, of the Bemis Bag Company, Boston, Mass., is completing arrangements for the erection of a branch factory at Welland. The company has agreed to expend the sum of $150,000 in buildings and equipment before the end of next year.

Geo. Clapp, until about a month ago foreman of the bolt works at the Montreal Rolling mills, Montreal, will, with some other interested parties, build and operate a tack factory at Welland. A site of two acres at that place has been chosen on which the industry will locate and building operations are expect

Companies Incorporated.

International Stock Food Co., Toronto; capital, $250,000; to manufacture cereals and health foods. Provisional directors, E. B. Savage, M. W. Savage and Fred Stokes.

Ha Ha Lumber Co., St. Alexis, Que.; capital, $45,000; to build and operate saw mills. Directors, B. J. Kaine, T. D. Pontbriand, G. L. Wells, F. L. Wells and M. H. DeWitt.

The Moyes Chemical Co., Ltd., Toronto; capital, $100,000; to manufacture drugs. Provisional directors, E. G. Morris, D. W. Jameson, T. R. J. Wray, W. G. Glenn and Mary E. Gibson, all of Toronto.

The National Acetylene Gas Co., Sherbrooke, Que.; capital, $60,000; to manufacture and sell acetylene gas generators, etc. Directors, J. O. Brusseau, J. P. Pelletier, E. Boudreau, Wm. Brault and J. Nicol.

The King Paper Box Co., Montreal; capital, $49,500; to manufacture cardboard and wooden boxes. Directors, O. Constantineau, J. H. Lefebvre, U. Bouliane, Wm. Bouliane and M. Langlois, all of Montreal.

The Canada Piano Co., Montreal; capital, $20,000; to manufacture musical instruments and sewing machines. Directors, V. Lavoie, L. E. Bernard, L. Hamelin, J. L. Chailloux and J. A. Hurtean, all of Montreal.

The International Time Recording Co., Toronto; capital, $10,000; to manufacture time recording and synchronizing clocks. Provisional directors, J. E. Day, J. M. Ferguson and E. V. O'Sullivan, all of Toronto.

A. Muirhead Co., Toronto; capital, $125,000; to manufacture and deal in paints, oils and varnishes. Provisional directors, A. Muirhead, J. Anthony, W. H. M. Bounell, J. G. Strong and W. R. Williams, all of Toronto.

The Lufkin Rule Co., of Canada, Windsor; capital, $100,000; to manufacture and deal in all kinds of rules and machinery. Provisional directors, T. Huss, E. Russel, A. R. Bartlet, N. A. Bartlet and Chas. H. Hitch.

Berna Commercial Motors, Toronto; capital, $250,000; to manufacture automobiles. Provisional directors, W. R. Parker, J. A. McEvoy and G. Russell, all of Toronto.

The American Dressing Co., Montreal; capital, $20,000; to manufacture boots, shoes, varnishes, polishes and oils. Directors, A. Saint-Martin, S. Laroque, J. B. Chartrand, A. Ouellet and A. L. Rinfeet, all of Montreal.

The Minto Rural Telephone Co., Harriston, Ont.; capital, $10,000; to carry on a general telephone business. Provisional directors, G. Gray, J. Meiklejohn, E. W. Lambert, J. J. Pritchard and A. Spotton, all of Harriston.

Bell's Lake Portland Cement Co.; Toronto; capital, $450,000; to manufacture cement, concrete blocks, etc. Provisional directors, R. J. Wilson, A. F. Rutter, J. S. King, E. H. Adams and T. E. McCraiken, all of Toronto.

Wheatley Telephone Co., Wheatley, Ont; capital, $20,000; to carry on telephone business in the County of Essex. Provisional directors, F. J. Fox, N. Coles, O. Lounsbur . R. Goodison, J. H. Allan, A. M. Wilson and J. A. Campbell.

The Canada Tool Co., Niagara Falls, Ont.; capital, $200,000; to manufacture and deal in machinery and tools. Provisional directors, F. J. Creedon, C. W. Davenport, Jr., E. A. Nelson, W. H. McGuire and F. W. Griffiths, all of Niagara Falls.

The Siliker Car Co.'s First Car.

The first car has been completed by the Silliker Car Co., the new industry of Halifax, N. S. It is just fourteen months since the first sod was turned. Two hundred men are employed in this works, and it is expected that three hundred will soon be employed. First cars made were for the I.C.R.

Rumored Merger of Montreal Companies.

It is rumored that Leslie M. Shaw, New York, is forming a forty million dollar merger of Canadian public utilities, the Montreal Light, Heat & Power Co. and the Montreal Street Railway being two organizations mentioned in connection with the merger. Shaw's recent trip to Montreal is the foundation for the rumor. This scheme was first talked of a year ago, but has not been heard of since until the present.

Preparing for More Business.

The Dodge Mfg. Co., of Toronto, are now very thoroughly settled in their new premises at Montreal, 640 St. Paul Street, corner Haymarket Square. They have some thirty two thousand square feet of floor space with ample handling and shipping facilities, which enables them to carry large stocks of all standard lines for quick distribution throughout eastern Canada. The company's stock carrying agents east of Montreal are now supplied from the Montreal branch.

A Thermo-Dynamics Building.

The estimates for the coming year were submitted by the finance committee to the Board of Governors of Toronto University and were approved. The expenditure of $100,000 for the erection and equipment of the building for thermo-dynamics, the first structure of the kind in Canada, was approved, as was also an expenditure, not to exceed $21,000, for the enlargement and equipment of the Worthington house for the departments of botany and forestry. It is estimated that $6,000 would be required for the entire renewal of the dining hall and kitchen equipment.

To Manufacture King Oil Furnaces

F. A. Jacobs, master mechanic of Dominion Car & Foundry Co., has accepted a position with the Francis Hyde Co., Montreal, as superintendent of the manufacture and sale of the King oil furnace and the Jacobs oil burner. Mr. Jacobs is the patentee of the oil burner, which is for high and low pressure. A plant for the manufacture of these articles is being erected on Wellington Street. Mr. Jacobs attended the convention of the Master Car Builders in Atlantic City to compare these burners and furnaces with those now in use in the car shops of the United States.

First Quarter's Trade.

The total trade of Canada for the first quarter of the present fiscal year was $114,870,967, a decrease of $35,269,622 as compared with the corresponding period of last year. Imports totaled $68,921,107, a decrease of $29,325,005. Exports totaled $45,949,860, a decrease of $5,944,617.

During the month of June the decrease in imports was $8,808,771, and the decrease in exports was $1,241,639.

The customs revenue for the three months was $10,638,298, a decrease of $4,231,968.

The monthly reports from now on will, it is expected, show a gradual betterment, consequent upon the passing of the effects on trade of the business depression of the winter and spring months.

Preference for Canada.

The Barbadoes Legislature has passed a law giving Canada preferential treatment of 20 per cent. on flour, cheese, cordage, butter, hay, oats, peas, fish, lumber (other than pitch pine), bacon, hams, iron and steel nails, spikes, rivets and clinches, shingles, bran, sulphate of ammonia and mixed manure, soap, beans, horses, boots and shoes, fish and meat (canned) iron or steel bars, hoops and rods, on condition that the Canadian preference is altered so as to leave a clear $6.72 per ton in favor of West Indian sugar, as against sugars from foreign countries. Canada's trade with Barbadoes is only 7½ per cent., and United States 40 per cent, and Great Britain 45 per cent. The new tariff extends to goods from all British countries, and will benefit Great Britain at the expense of the American manufacturer quite as much as, if not more than, Canada.

Imperial Locomotive Works.

F. Orr Lewis, of Lewis Bros., Montreal, returned home on Saturday, July 11, from the Old Country, where he and Mrs. Lewis spent the winter. Mr. Lewis found the investors of England and Scotland greatly interested in Canada and many had bought Canadian stocks, especially that of the railroads.

One of the results of his visit to England will be the establishment of the Imperial Locomotive Works at Lachine, an enterprise in which Mr. Lewis is greatly interested. This, as has been stated in Canadian Machinery, is an offshoot of Beyer, Peacock & Co., Coventry, Eng., one of the largest locomotive builders in the world, and will cost about $2,250,000. Plans have already been prepared and tenders called for. The preliminaries have all be arranged, and it is expected that work on the foundations will begin about August 15. This concern will give employment to about 2,000 men, most of them skilled mechanics. The site is at

Lachine, the Johnston farm, containing 100 acres, having been secured. Some good orders fram the Canadian railroads have already been promised.

Confidence in Canada is increasing rapidly in the money market of the world, and it is expected that the establishment of this enterprise will be followed by others.

New British Patent Law.

The new patent law which went into effect in Britain on July 28, stipulates that foreigners who hold or may obtain British patents must manufacture the patented goods on British soil. This law will operate to some extent against Canadian manufacturers, for a Canadian company sending its patented goods to Britain may find a British company manufacturing the same goods, and they cannot sue the British company for infringement of patent rights.

These new regulations were aimed primarily against Germany and the United States, as the patent laws of these two countries stipulate that articles patented in Germany or the United States must be manufactured in the country. The law operates against Canada, as well and as thousands of Canadian patents are registered in England, the application of the law will be seriously felt here. A large number of Canadian companies, including the large implement concerns, manufacture patented goods for the Old Country market. They may be able to satisfy the requirements of the law, however, by opening British factories with only a nominal output.

There has been a year's warning given of the passage of the new law, so as to allow manufacturers to establish branches in Britain. Many branches have already been started giving employment to a great number of British workmen. It is estimated that the new law has already secured the investment of $125,000,000 for the manufacture of articles in Britain previously made abroad.

Power Union Protests Against Hamilton

A meeting of the Western Municipalities Power Union was held in Guelph on July 15, to protest against the action of the city council of Hamilton in regard to the negotiations they have been carrying on with the Cataract Power Co.

A resolution was passed and sent to the city council of Hamilton suggesting:

That the city of Hamilton submit the contract of the Hydro-Electric Power Commission and the offer of the Cataract Co. to the electors.

That the Commission be asked to embody in any future contracts with the municipalities (if found necessary) a provision that no municipality which has failed to execute a power contract with the Commission shall be hereafter permitted to obtain the benefit of Niagara power from the Commission, without the consent of the majority of the contracting municipalities, and, if necessary, that legislation be obtained for that purpose.

The price of power as outlined in the agreement between the city council of Hamilton and the Cataract Power Co., which agreement is now being held up, is as follows: For civic plants, $16 a horse-power; for street lighting the rate is $47.50; for incandescent lighting the company agree to furnish light at 10 per cent. below the rates charged in Toronto for lights operated by power furnished under agreement with the Hydro-Electric Commission. The minimum monthly charge is reduced from $1 to 75 cents. As to small power users, all the company proposes to do is not to raise the rates any higher than at present for five years.

Ruling Regarding Interswitching.

The complaint of the Canadian Manufacturers' Association regarding the charges made for interswitching, which was heard in Toronto in November last and again at the sittings of the Railway Commission in May of this year, has been considered by the board, and an order has been made, dated July 8, 1908, to the effect that it shall be lawful for the contracting carrier to continue to absorb the toll charged for the interswitching of competitive traffic.

As regards traffic destined to consignees located upon or reasonably convenient to the tracks of the contracting carrier, or which may be so consigned as not to indicate clearly the delivery required, and which subsequent to shipment is ordered by the shipper, consignee or the agent of either for interswitch delivery involving an additional service by another carrier, and which is so interswitched, the contracting carrier may charge and collect in addition to its freight charges the interswitching toll of the carrier which performs such service, which toll shall not be more than 20c per ton for any distance not exceeding four miles.

Upon traffic consigned to consignees located upon or reasonably convenient to tracks other than those of the contracting carrier, or to consingees who have customarily required such other carrier's delivery, the contracting carrier may for the interswitching service rendered necessary for such delivery charge and collect an additional toll of not more than 10c per ton for any distance not exceeding four miles, the distance to be computed to or from the nearest point of interswitching.

The foregoing tolls shall include the empty movement of the car to and from points on which it is received by the interswitching carrier.

Traffic interswitched at the point of shipment shall be subject to the same conditions, as also traffic consigned to order.

By this order the carriers are required to reduce their tolls for switching within terminals. On such traffic as originates at non-competitive points the contracting carrier is required to absorb 50 per cent. of the toll of the carrier which performs the interswitching service.

Heretofore a manufacturer located at a point where there was only one line of railway was discriminated against in his rates to the extent of this switching charge. While the order does not place him on an equal footing with the shipper located where there are competing roads, it places him in a much better position than he was. The contention of the Manufacturers' Association has been that the carriers should afford shippers at local points who are compelled by reason of their location to ship over one line of railway the same facilities for doing business as the shipper located where there are several lines of railway.

CATALOGUES WORTH HAVING.

CINCINNATI SHAPERS—An exceptionally attractive catalogue of the Cincinnati Shaper Co., Cincinnati, O. Embossed cover; excellently illustrated and printed in brown and black; standard size. A most complete shaper catalogue. Every manufacturer should have a copy.

THE FOUNDRYMEN'S REFERENCE BOOK.—Catalogue of foundry supplies published by Whit-

ing Foundry Equipment Co., Harvey, Ill. It tells about cranes, ladles, trucks, tumblers, turntables, brass furnaces, cupola accessories, air hoists, elevators, trolleys, core ovens, sand sifters, core oven cars, and charging machines. In fact, it contains something about everything needed in a foundry.

CUTTING-OFF SAW—Folder illustrating and telling all about the new Burke cold saw. This saw has some interesting and distinctive features. Burke Machinery Co., Cleveland, O.

GISHOLT TOOLS—Pocket size catalogue of Gisholt tools, including turret lathes, vertical boring mills, universal tool grinders, horizontal drilling machines, double emery grinders, worm hobbing machines, gear testing machines, chucks, etc. A particularly handy little book illustrating the tools, their manner of operation and the work which can be done to advantage on each. It is quite a handy book of information for users of Gisholt tools, and a mine of information for non-users. The Gisholt Machine Co., Madison, Wis.

BOILERS AND ACCESSORIES—A very handsome catalogue telling all about the boilers, feed pumps, etc., made by the Jenckes Machine Co., Ltd., Sherbrooke, Que. The catalogue is well illustrated and contains detail information concerning their boilers, and also instructions and data concerning boiler settings.

POWER PLANT EQUIPMENT—Bulletin No. 105 of the John McDougall Caledonian Iron Works Co., Ltd., Montreal. Descriptive of the Erie City water table and fire tube boilers, feed-water heater, "four-valve engine, enclosed high-speed engine, the Knowles, Deane and Worthington pumps and double impulse water-wheels.

"BROWNHOIST" MACHINERY—A catalogue of full page illustrations of machinery for the handling of coal, coke and other material, showing various installations which have been made by the Brown Hoisting Machinery Co., Cleveland, O. Illustrations have been chosen so as to illustrate the various styles of installations of machinery for handling coal or similar material. A complete description of the "Brown hoist" patent gap bucket is given.

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PAXSON'S FREIGHT LINES—A catalogue telling about the past and present fleet owned by the J. W. Paxson Co., Philadelphia, Pa., for conveying molding sand. Besides, there are described the various foundry supplies handled by the company.

SINGLE STAGE TURBINE PUMPS—Bulletin No. 103 of the John McDougall Caledonian Iron Works Co., Montreal, giving a complete illustrated description of the Worthington single stage turbine pumps.

AUTO CLIMAX ENGINE—Small booklet illustrating and telling about the new vertical automatic steam engine which is being placed on the market by J. T. Schell, Alexandria, Ont. This engine has some special features worth investigating.

ANTI-FRICTION METAL—Catalogue of the Glacier Metal Co., 116 Broad Street, New York, giving facts relating to Glacier anti-friction metal, its uses and advantages. The catalogue contains records of the tests made on this metal by the Sheffield Testing Works, Sheffield, which show up so well that all users of bearing metal should see these records.

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MINE FANS—Catalogue 26 from Jeffrey Mfg. Co., Columbus, Ohio, describing and illustrating the construction and operation of their mine fans.

PULVERIZERS—Catalogue 31a from Jeffrey Mfg. Co., Columbus, Ohio, illustrating in detail and describing their complete line of crushers and pulverizers.

DRILLS—Circular from Alexander Gibb, 13 St. John St., Montreal, describing the improved high-speed twisted drills made from Beardshaw's tool steel.

STOKER—A descriptive catalogue from Jones Underfeed Stoker Co., Montreal, illustrating the Jones underfeed automatic mechanical stoker and its application to the various types of boilers.

BOOK REVIEWS.

FORMULAS IN GEARING—The fifth edition of this work. Published by Brown & Sharpe Mfg. Co., Providence, R. I. Distributed to friends and patrons of this company.

This is probably the most practical and useful book published on this subject. The subject is dealt with from the draftsman's standpoint. All problems in gearing which are met with in ordinary practice, excepting those dealing with the transmission of power and strength of gearing, are dealt with and condensed to essential considerations. The mathematical considerations have been reduced to ordinary algebra and elementary trigonometry.

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VOIDS, SETTLEMENT AND WEIGHT OF CRUSHED STONE—Bulletin No. 23 of the University of Illinois; by Ira O. Baker. For free distribution.

Results of careful tests made by the author under the auspices of the University. The experiments were conducted because of the lack of reliable information on the subject. The bulletin, therefore, contains much valuable information which cannot be obtained elsewhere.

SLOW BURNING OR MILL CONSTRUCTION—Third edition of report No. 5 of the Insurance Engineering Experiment Station on this subject, under the direction of the Boston Manufacturers' Mutual Fire Insurance Co., 31 Milk Street, Boston. Nominal price of 25 cents to limit distribution to those who are really interested.

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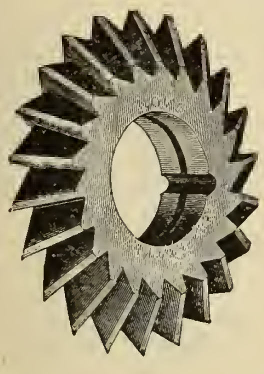

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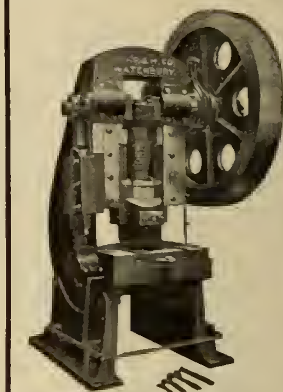

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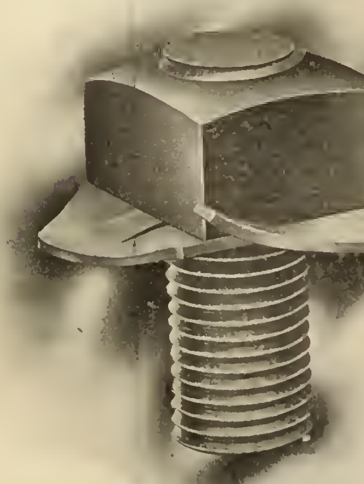

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Jeffrey Mfg. Co., Columbus, Ohio.

Cupolas.

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Dominion Foundry Supply Co., Montreal
De Clercy, J., Montreal
Hamilton Facing Mill Co., Hamilton.
Hyde, Francis & Co., Montreal
Northern Engineering Works, Detroit
Sheldons Limited, Galt.
Smith, J. D., Foundry Supply Co., Cleveland, Ohio.
Whiting Foundry Equipment Co. Harvey, Ill.

Cupola Blast Gauges.

Dominion Foundry Supply Co., Montreal
Sheldons Limited, Galt

Cupola Blocks.

Detroit Foundry Supply Co., Detroit.
Dominion Foundry Supply Co., Toronto
Hamilton Facing Mill Co., Hamilton
Hyde, Francis & Co., Montreal
Northern Engineering Works Detroit
Ontario Lime Association Toronto

Cupola Blowers.

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Detroit Foundry Supply Co., Windsor
Dominion Foundry Supply Co, Toronto
Hamilton Facing Mill Co., Hamilton.
Hyde, Francis & Co., Montreal
Northern Engineering Works, Detroit
Sheldon's Limited, Galt.

Cupola Linings.

Maurer, Henry, & Son, New York.
Stevens, F. B. Detroit, Mich.

Cutters, Flue

Independent Pneumatic Tool Co., Chicago Ill.

Cutter Grinder Attachment.

Cincinnati Milling Machine Co., Cincinnati

Cutter Grinders.

Cincinnati Milling Machine Co., Cincinnati

Cutters, Milling.

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Becker Milling Machine Co, Hyde Park, Mass.
Cleveland Twist Drill Co., Cleveland
Hamilton Tool Co., Hamilton, Ont.
National Twist Drill & Tool Co., Detroit
Owen Machine Tool Co, Springfield, Mass.
Pratt & Whitney Co., Hartford, Conn.
Standard Tool Co., Cleveland.

Cutting-off Machines.

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John Bertram & Sons Co., Dundas, Ont.
Burke Machinery Co, Cleveland, Ohio
Canada Machinery Agency, Montreal.
Rice Lewis & Son, Toronto.
London Mach. Tool Co., Hamilton.
H. W. Petrie, Toronto.
Pratt & Whitney Co., Hartford, Conn.

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Armstrong Bros. Tool Co., Chicago.
London Mach. Tool Co., Hamilton.
H. W. Petrie, Toronto.
Pratt & Whitney, Hartford, Conn.
Rice Lewis & Son, Toronto.
L. S. Starrett Co., Athol, Mass.

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Darling Bros., Ltd., Montreal

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Acme Stamping & Tool Co., Hamilton.
Armstrong Bros., Toronto
Banfield, W. H. & Son, Toronto
Bliss, E. W., Co., Brooklyn, N.Y.
Brown, Boggs Co., Hamilton
Ferracute Machine Co, Bridgeton, N.J.
Gardner, Robt. & Son, Montreal
Cleal, Joseph P., Toronto
Globe Machine & Stamping Co., Cleveland. Ohio.
Hall J. H., & Sons, Brantford
Hall, Jas. B., Toronto
Scott, Ernest, Montreal.
Stevens Co, Galt

Die Making Machinery.

Stevens Co., Galt, Ont.

Die Stocks

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Curtis & Curtis Co., Bridgeport, Conn.
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Dies, Opening

W. H. Banfield & Sons, Toronto
Globe Machine & Stamping Co., Cleveland Ohio.
Jardine, A. B. & Co., Hespeler, Ont.
Pratt & Whitney Co., Hartford Conn.

Dies, Threading,

Canadian Tap & Die Co., Galt
Hart Mfg. Co., Cleveland
Jardine, A. B., & Co., Hespeler, Ont.
John Millen & Son, Ltd, Montreal.

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W. H. Banfield & Sons, Toronto.
Butterfield & Co. Rock Island, Que.
A B. Jardine & Co. Hespeler
Pratt & Whitney Co., Hartford, Conn.
Sheldons Limited, Galt.

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Union Drawn Steel Co., Hamilton.

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American Tool Works Co., Cincinnati.
John Bertram & Sons Co., Dundas, Ont.
Bickford Drill and Tool Co., Cincinnati.
The Canadian Fairbanks Co., Montreal.
A. B. Jardine & Co., Hespeler, Ont.
London Mach. Tool Co., Hamilton, Ont.
Lewis, Rice & Son. Toronto
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.
Williams & Wilson, Montreal

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American Tool Works Co., Cincinnati.
John Bertram & Sons Co., Dundas, Ont.
Bickford Drill & Tool Co., Cincinnati.
Canada Machinery Agency Montreal.
Rice Lewis & Son, Toronto.
London Mach. Tool Co., Hamilton, On
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.
Williams & Wilson, Montreal.

Drilling Machines, Radial.

American Tool Works Co, Cincinnati.
Bickford Tool & Drill Co., Cincinnati.
The Canadian Fairbanks Co., Montreal.
Rice Lewis & Son, Toronto
London Mach. Tool Co., Hamilton.
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.
Williams & Wilson, Montreal.

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John Bertram & Sons Co., Dundas, Ont
London Mach. Tool Co., Hamilton.
Niles-Bement-Pond Co., New York.

Drilling Machines, Upright.

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Hamilton Tool Co. Hamilton Ont.
A. B. Jardine & Co., Hespeler, Ont.
Rice Lewis & Son, Toronto.
London Mach. Tool Co., Hamilton.

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Lewis, Rice & Son, Toronto.
London Mach. Tool Co., Hamilton.
Niles-Bement-Pond Co., New York.

Drills, Bench.

Hamilton Tool Co, Hamilton, Ont.
Lewis, Rice & Son, Toronto.
London Mach. Tool Co., Hamilton.
Pratt & Whitney Co., Hartford, Conn.

Drills, Blacksmith.

Canada Machinery Agency, Montreal.
A. B. Jardine & Co., Hespeler, Ont.
London Mach. Tool Co., Hamilton.
National Twist Drill & Tool Co., Detroit
Standard Tool Co., Cleveland.

Drills, Centre.

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Lewis, Rice & Son, Toronto.
National Twist Drill & Tool Co., Detroit
Pratt & Whitney Co., Hartford, Conn.
Standard Tool Co., Cleveland, O.
L. S. Starrett Co., Athol, Mass.

Drills, Coal and Plaster.

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Drills, Electric

Canadian Pilling Co., Montreal
Gas & Electric Power Co., Toronto.
Niles-Bement-Pond Co., New York.

Drills, High Speed.

Abbott, Wm., Montreal
Cleveland Twist Drill Co, Cleveland
Alexander Gibb Montreal
Lewis, Rice & Son, Toronto.
Lincoln-Williams Twist Drill Co., Taunton, Mass.
National Twist Drill & Tool Co, Detroit
Pratt & Whitney Co., Hartford, Conn
Richardson, John L. & Co, Toronto
Standard Tool Co., Cleveland, O.

Drills, Hand.

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Drills, Pneumatic.

Allen, John F., New York
Canada Machinery Agency, Montreal.
Canadian Rand Co, Montreal
Independent Pneumatic Tool Co., Chicago, New York
Niles-Bement-Pond Co., New York

Drills, Ratchet.

Armstrong Bros. Tool Co, Chicago.
Cleveland Twist Drill Co., Cleveland
A. B. Jardine & Co., Hespeler,
National Twist Drill & Tool Co, Detroit
Pratt & Whitney Co., Hartford, Conn.
Standard Tool Co., Cleveland.

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American Tool Works Co., Cincinnati.
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Northern Engineering Works, Detroit
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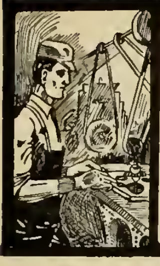

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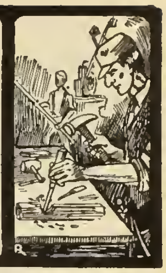

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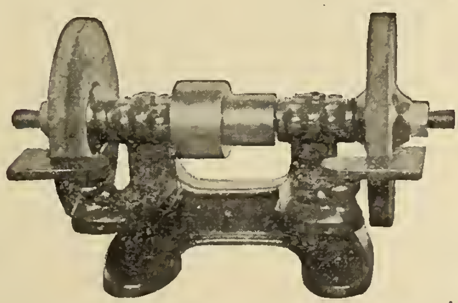

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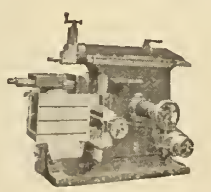

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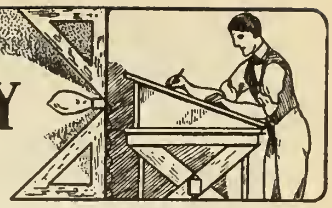

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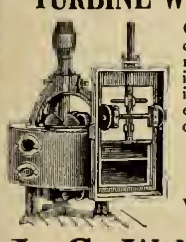

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McKenzie, D., Guelph, Ont
Simonds Canada Saw Co., Montreal.
L. S. Starrett Co., Athol, Mass.

Scientific Books.
American Industrial Pub. Co, Bridgeport, Conn.

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Canada Machinery Agency, Montreal.
London Mach. Tool Co., Hamilton, Ont.
National-Acme Mfg. Co., Cleveland.
Pratt & Whitney Co., Hartford, Conn.

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Canada Machinery Agency, Montreal.
A. B. Jardine & Co., Hespeler.
London Mach. Tool Co., Hamilton, Ont.
Pratt & Whitney Co., Hartford, Conn.
Warner & Swasey Co., Cleveland, O.

Screw Machines, Multiple Spindle.
National-Acme Mfg. Co., Cleveland

Screw Plates.
Butterfield & Co., Rock Island, Que.
Canadian Tap & Die Co., Galt
Hart Manufacturing Co. Cleveland, Ohio
A B. Jardine & Co., Hespeler

Screw Slotting Machinery, Semi-Automatic.
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The Canadian Fairbanks Co., Montreal.
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Fay, J. A., & Egan Co., Cincinnati
Gardner, Robt. & Son, Montreal
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Owen Sound Iron Works Co., Owen Sound
H. W. Petrie, Toronto.
Smart-Turner Machine Co., Hamilton.
Union Drawn Steel Co., Hamilton.
Waterous Engine Co., Brantford.
Wilson, J. C., & Co., Glenora, Ont.

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John Bertram & Sons Co., Dundas, Ont
Canada Machinery Agency, Montreal.
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Cincinnati Shaper Co., Cincinnati, Ohio
Gardner, Robt, & Son, Montreal
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London Mach. Tool Co., Hamilton, Ont
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Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.
Pratt & Whitney Co., Hartford, Conn.
Stockbridge Machine Co., Worcester
Williams & Wilson, Montreal.

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Stockbridge Machine Co., Worcester, Mass.

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Carborundum Co., Niagara Falls, N.Y.

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Niles-Bement-Pond Co., New York.

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Dominion Foundry Supply Co., Montreal
Hamilton Facing Mill Co., Hamilton.
Hyde, Francis & Co., Montreal

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Dominion Foundry Supply Co., Toronto
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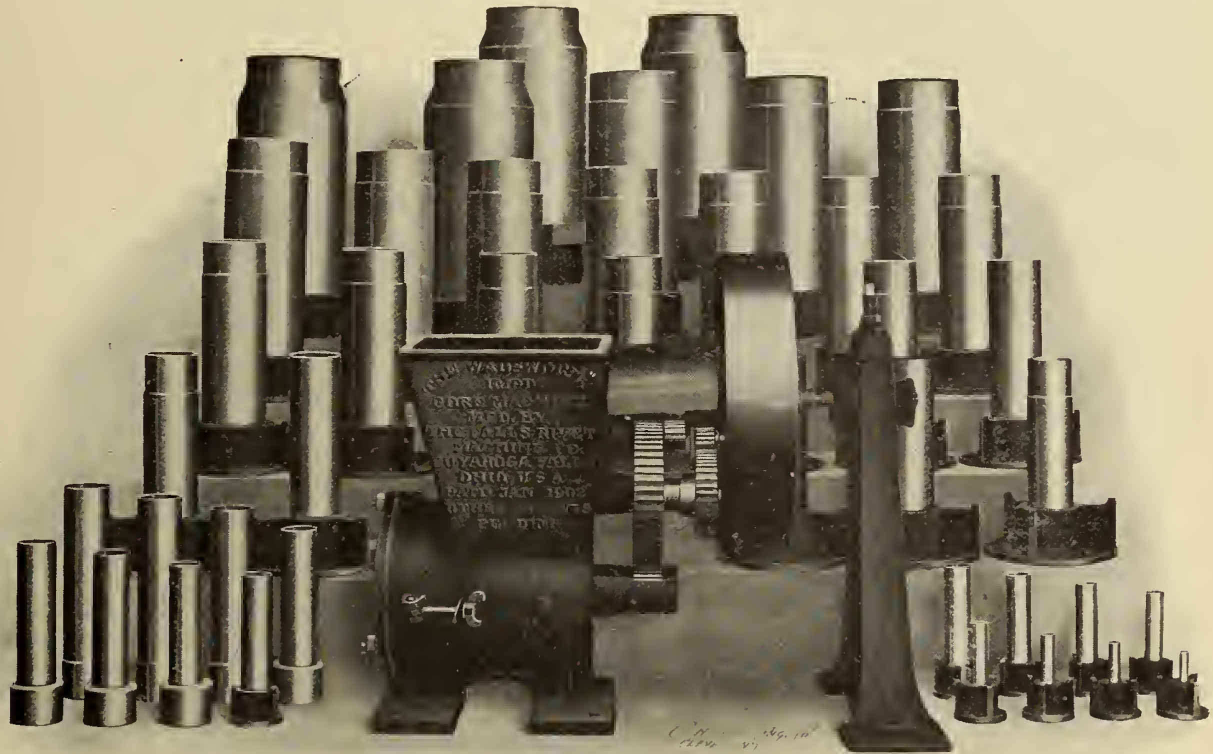

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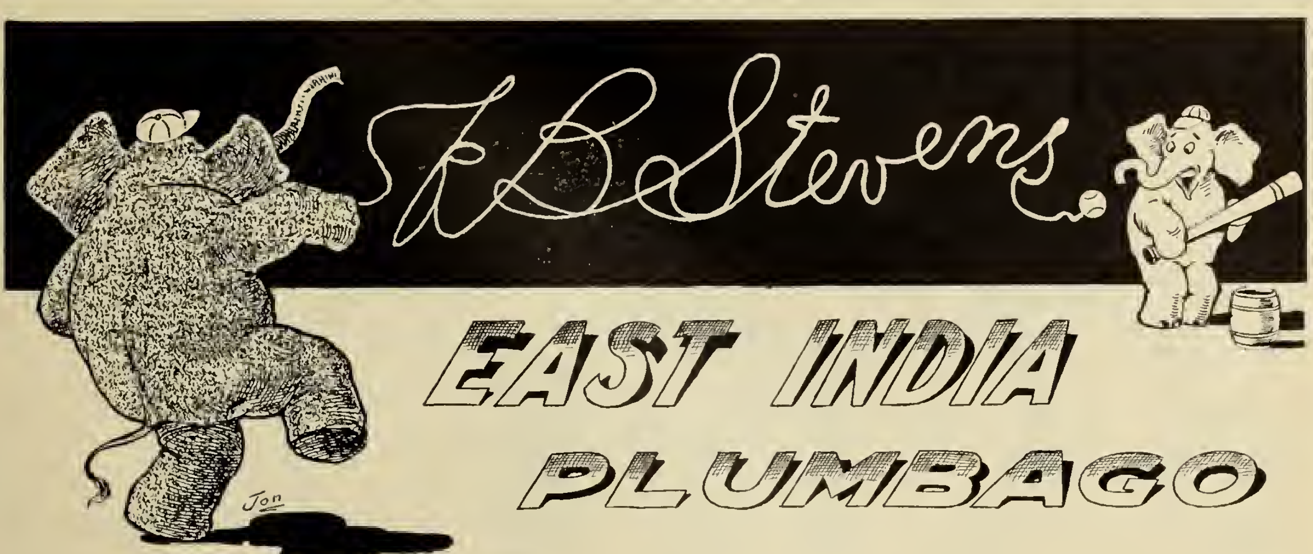

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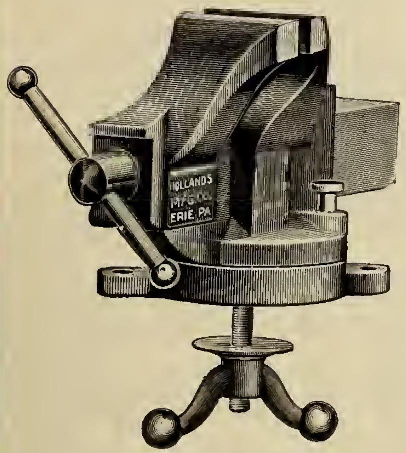

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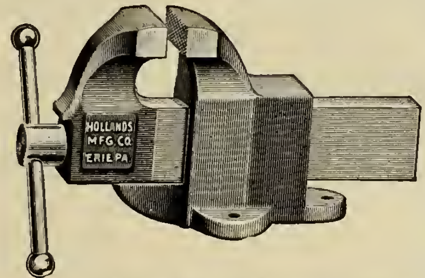

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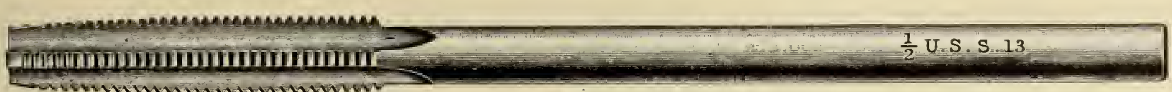

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Whenever you think of

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The marvellous results obtained from the use of our Drills are facts, not theories.

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WELL KNOWN BRANDS MADE IN CANADA BY

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They cut right or left hand threads, standard or special pitch, and their use on screw machines or turret lathes is a guarantee of cost reduction.

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If we should hand you a sum of money equal to 20% of your Twist Drill account, would you take it? Most likely you would.

While you may not see any "real money," if you will use

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"Norka" High Speed Twist Drills are the strongest High Speed Twist Drills made, as they are twisted while hot and the grain of the steel is not disturbed, therefore your breakage will be practically eliminated.

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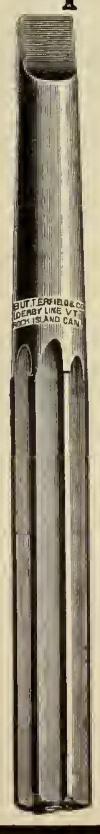

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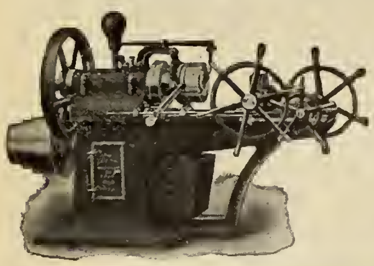

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In addition to the regular parallel vial, the bases have a cross level which enables one to place or hold the base on a shaft level in its cross section, not canted sidewise ; for the shape of a level glass is such that, though true as adjusted on a flat surface, it will not be reliable when canted sidewise. Hence the value of the cross level, not only to test the truth of shafting, but other surfaces which tend to throw the level base into a canting position.

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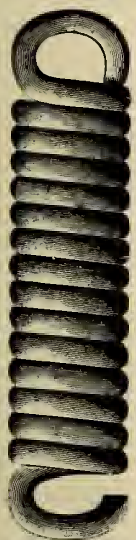

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—for every purpose and the best for each use.

—Special styles of all kinds to order.

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ALL KINDS OF
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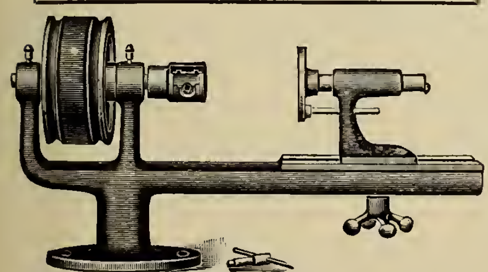

Champion Tapping Machine

Especially adapted for high speed tapping in light work.
Taps holes either through or to depth. Is automatic in operation, very rapid and reduces the breakage of taps to the minimum. Capacity up to $\frac{1}{4}$-in. holes.

MANUFACTURED BY THE
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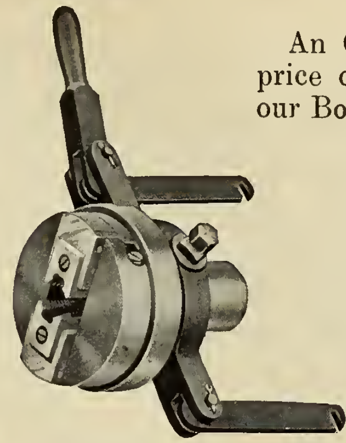

An Opening Die for very little more than price of any good Adjustable Die. Sold with our Bolt Threading Machines, or can be used with any Bolt Threader.

Saves time in running back off the bolt.

Saves wear of Die.

Well worth investigation.

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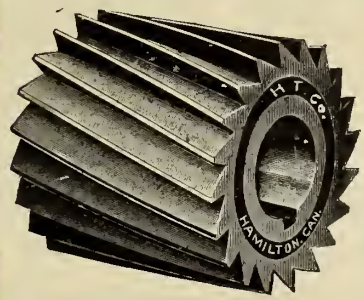
Milling Cutters, Reamers, Relieved Wood Shaper Cutters of all kinds



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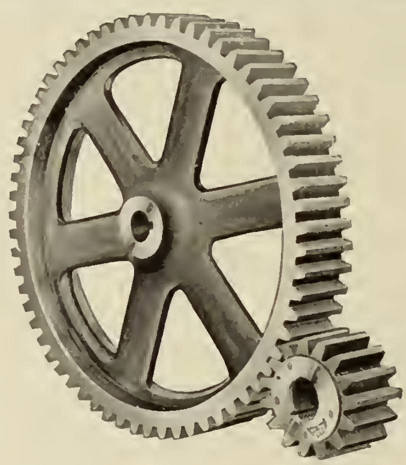

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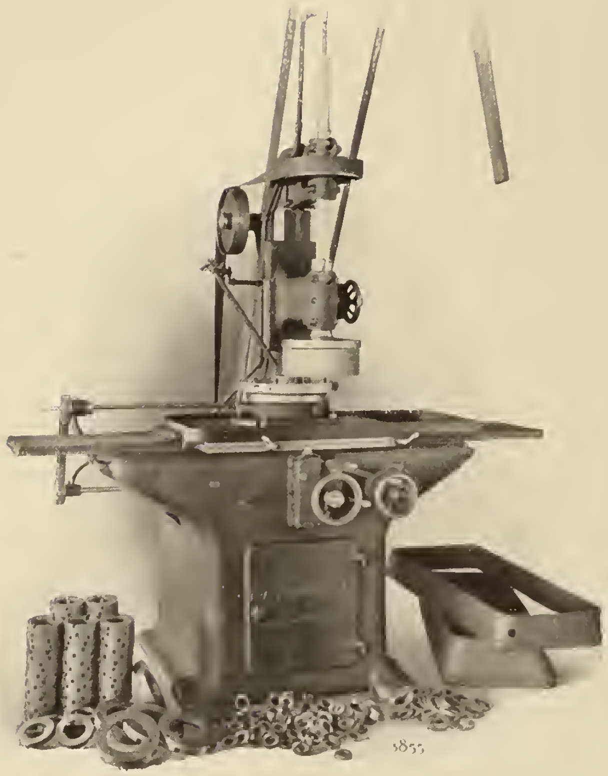
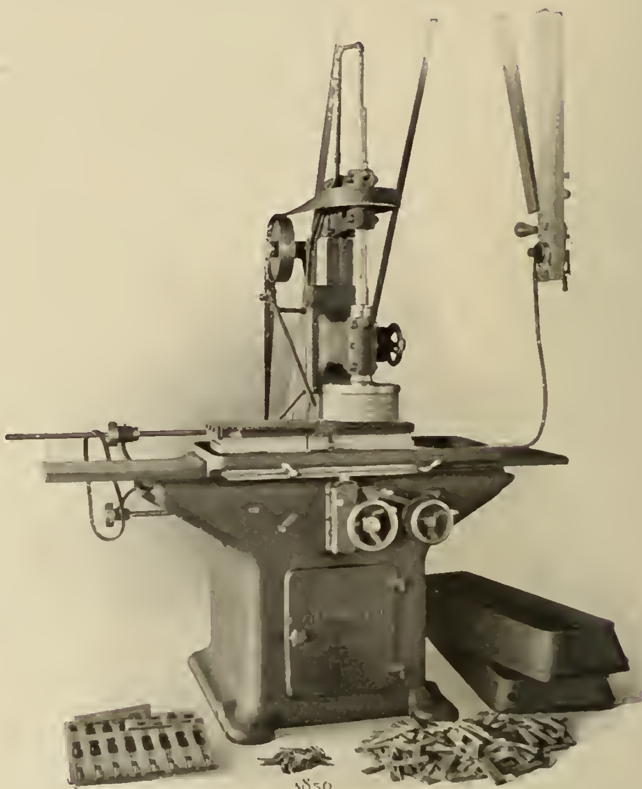
WILL GRIND FROM 10 to 25 TIMES FASTER THAN ANY SURFACE GRINDER KNOWN.



Grinding Discs, Rings, Collars, Etc., on Revolving Table.



Grinding Flat Wcrk, held in place by Magnetic Chuck

The vertical cup wheel covers full width of work at once, insuring more perfect surfaces and much greater output than is possible with any other grinder.

Water enters through the hollow spindle and is driven by centrifugal force between the wheel and the work, thus keeping work free from dust.

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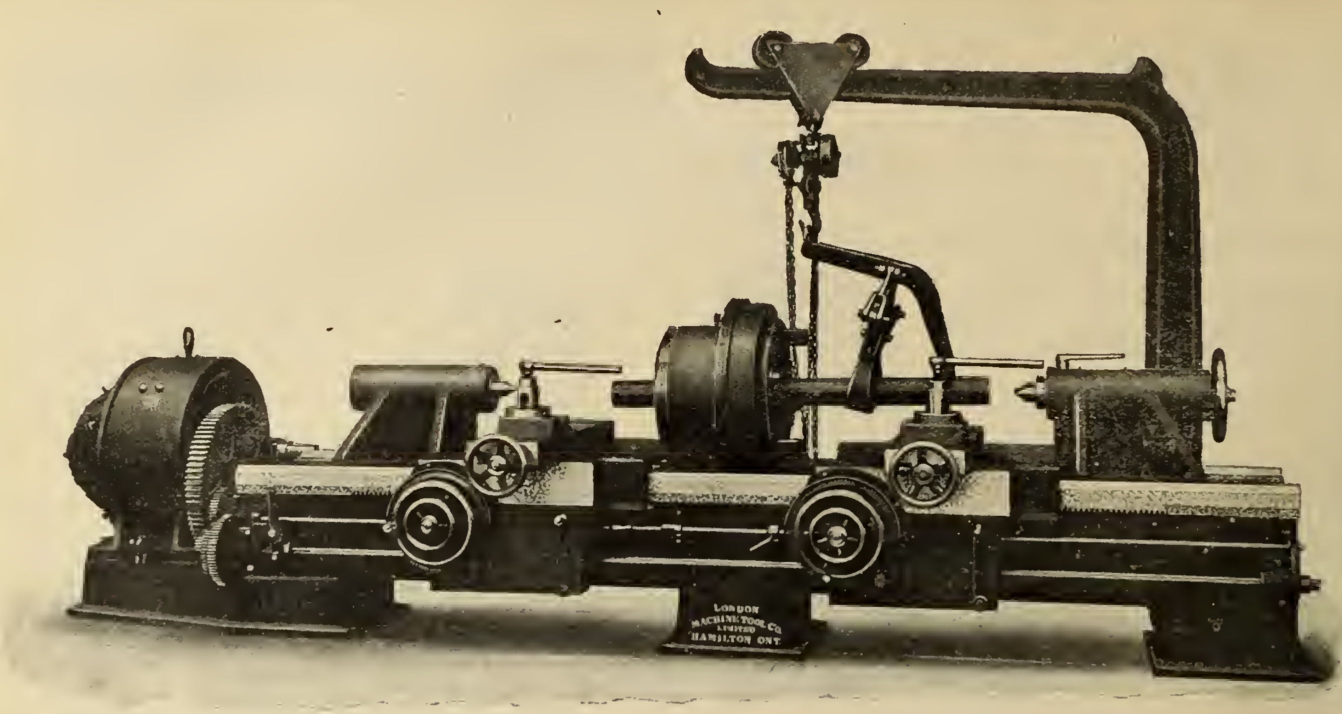

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As arranged with 20 horse power Westinghouse Type S motor for Grand Trunk Railway System, Stratford, Ont.

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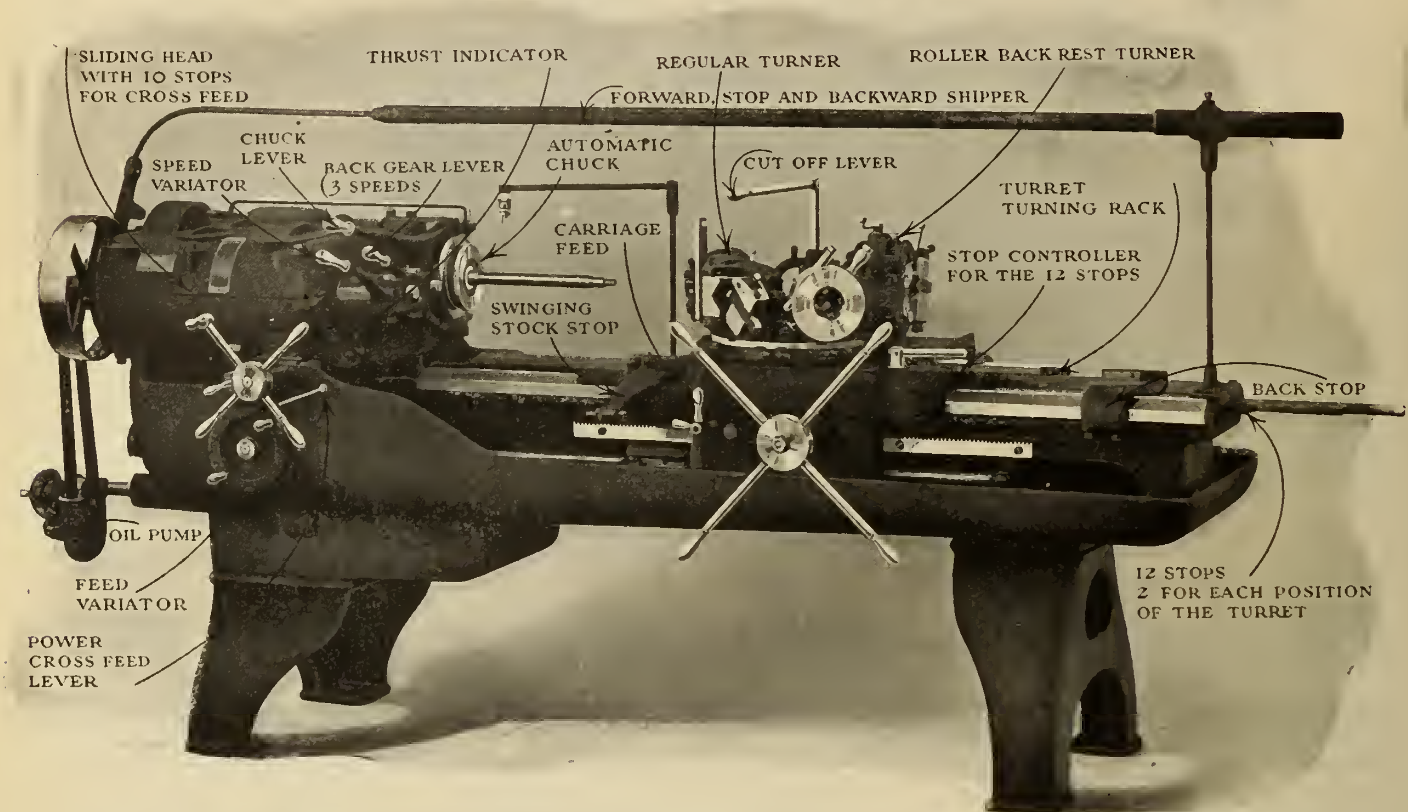
THE

Hartness Flat Turret Lathe



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The Lathes are now equipped with outfit of tools for handling both bar and chucking work. This tool equipment is of the adaptable kind, taking care of all work within the range of machine—NO SPECIAL TOOLS REQUIRED. A change in your product does not call for a new tool equipment.

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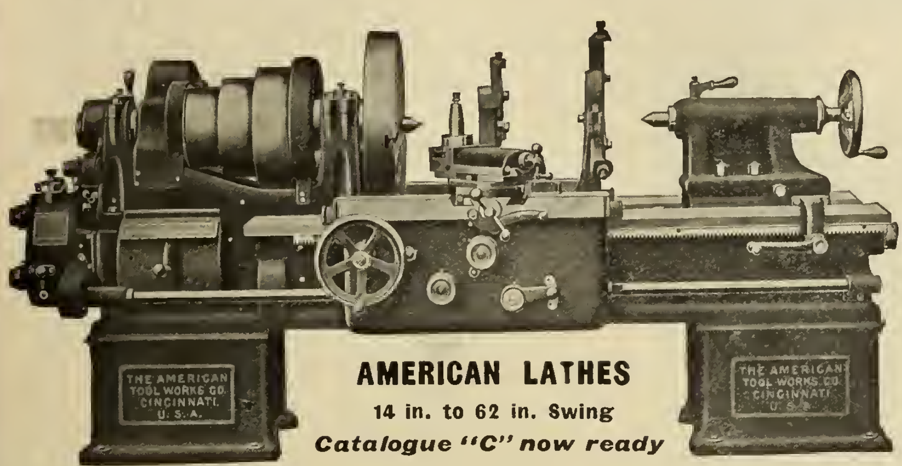

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14 in. to 62 in. Swing
Catalogue "C" now ready

It's that "Patented"

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16 in.	LATHE SWING		18½ in.
20 in.	"	"	22½ in.
36 in.	"	"	38 in.
60 in.	"	"	62 in.

Also permits more Metal in the Carriage Bridge with increased Swing over Compound Rest.

Think of the saving in "First Cost" by taking advantage of the "Swing Feature" alone, to say nothing of the Power, Accuracy and General Excellence of "AMERICAN" LATHES.

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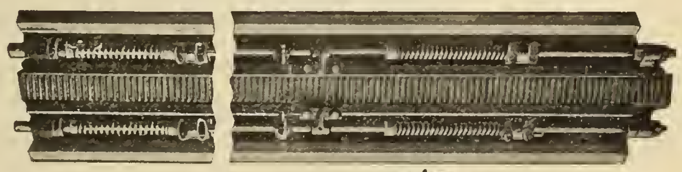
has the same effects on planers that choppy seas have on men—punishing effects ! ! !



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"Topspeed" Planers

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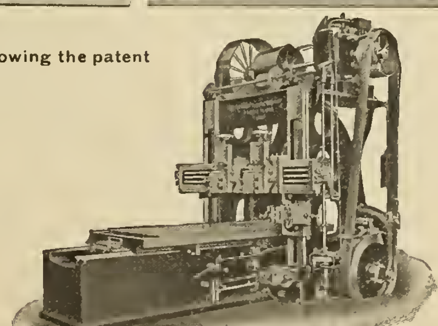

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Because of their concentrated, convenient operation; wide range of table feeds automatic in all directions; extremely simple, compact and efficient rapid feed change mechanism; guaranteed accuracy; powerful and massive construction throughout.

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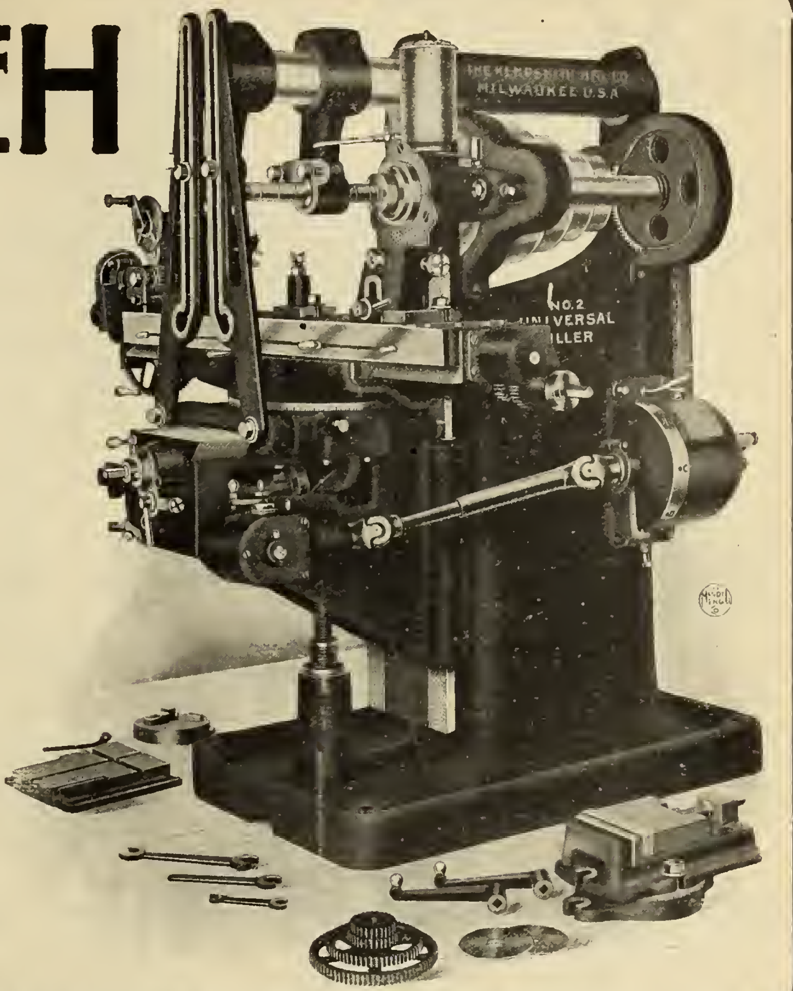

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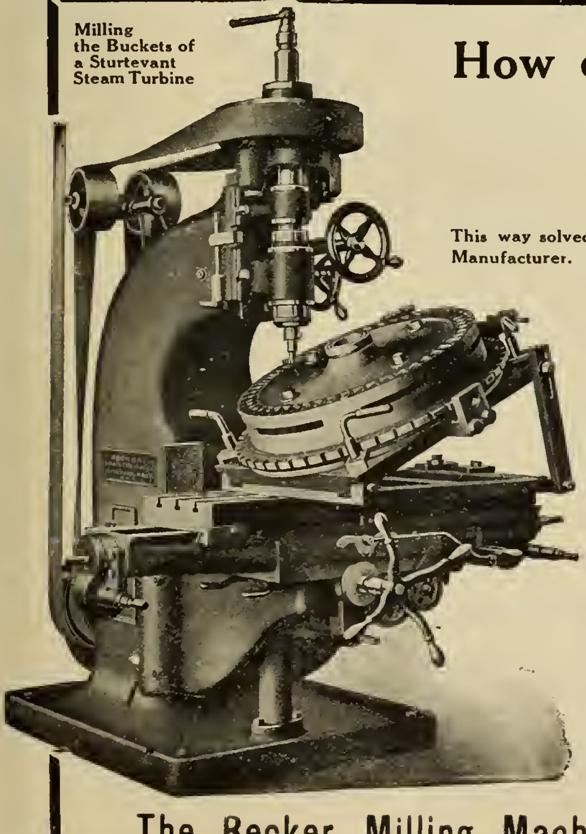

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There's only one way to do it and that is on a

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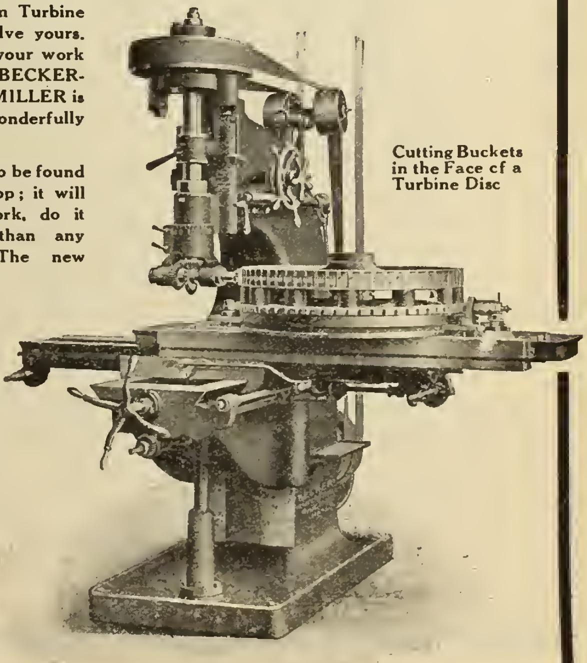
This way solved the problem for the Steam Turbine Manufacturer. Some other way would solve yours. Send us details regarding your work and let us show you. The BECKER-BRAINARD VERTICAL MILLER is equal to anything ; it's a wonderfully versatile tool.

It's the most adaptable tool to be found in the modern machine shop ; it will do a larger variety of work, do it better and do it quicker than any other single machine. The new horizontal attachment adds to the essential features of the horizontal type, including the cutting of spirals. The permanency of alignment of the vertical spindle, the staunch design, tbe great depth of throat, the convenience of operation, all combine to make it an indispensable tool.



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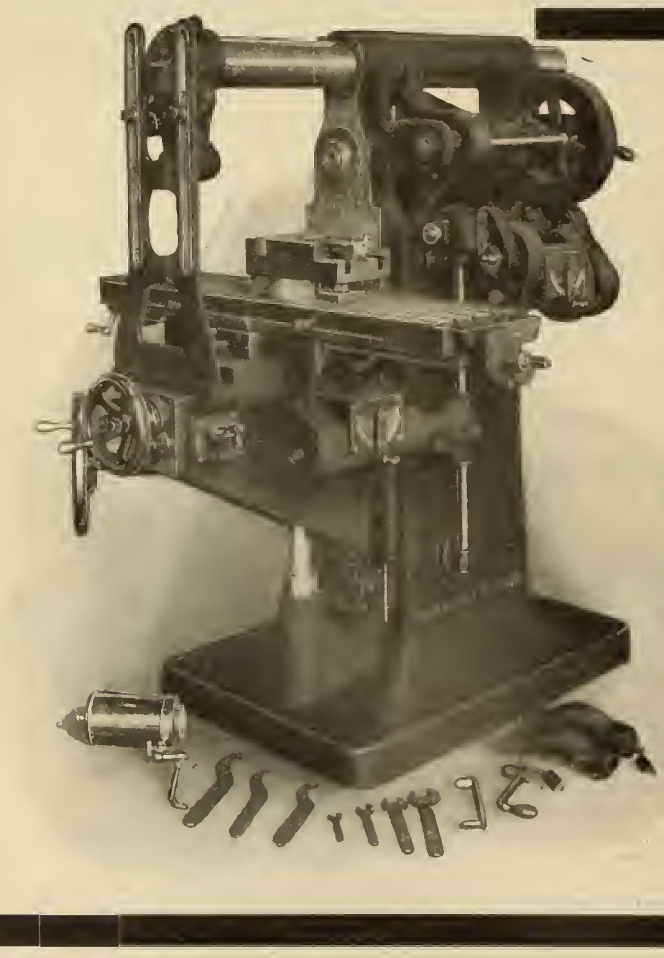

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when it is invested in a machine that can be kept working **all the time.** That's why it pays to invest your money in a

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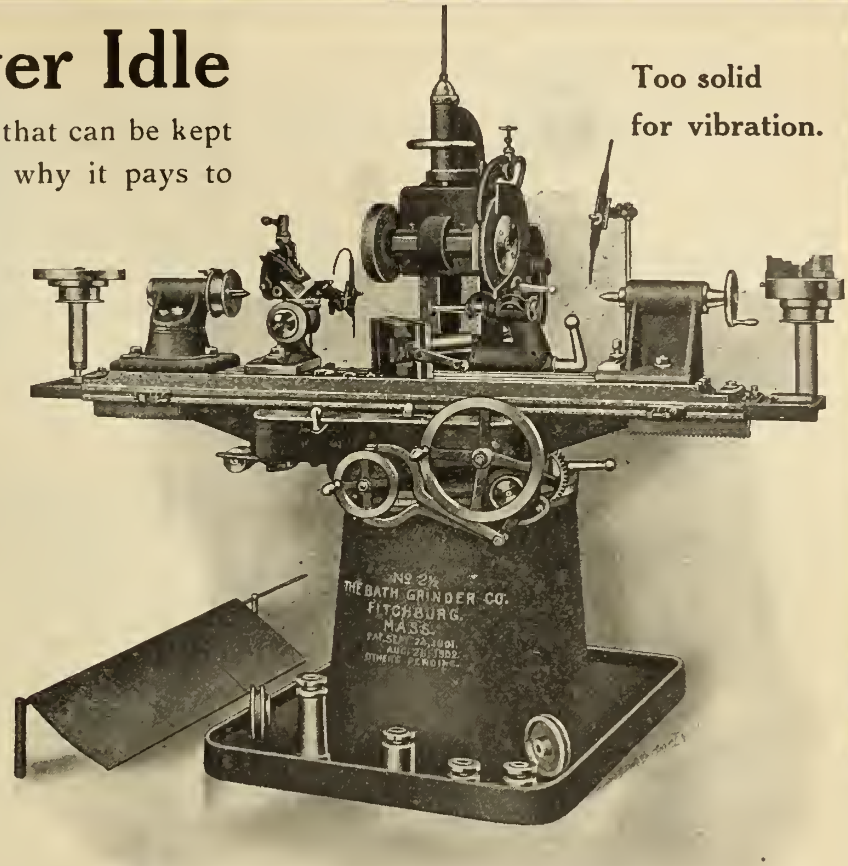

Too solid for vibration.

Its range is so wide that you can make it **earn money all day long.** It will grind with absolute accuracy all kinds of reamer and cutter work, surface work, face grinding, internal work and cylindrical work on centers It has a water attachment and will do wet or dry grinding with equally great success.

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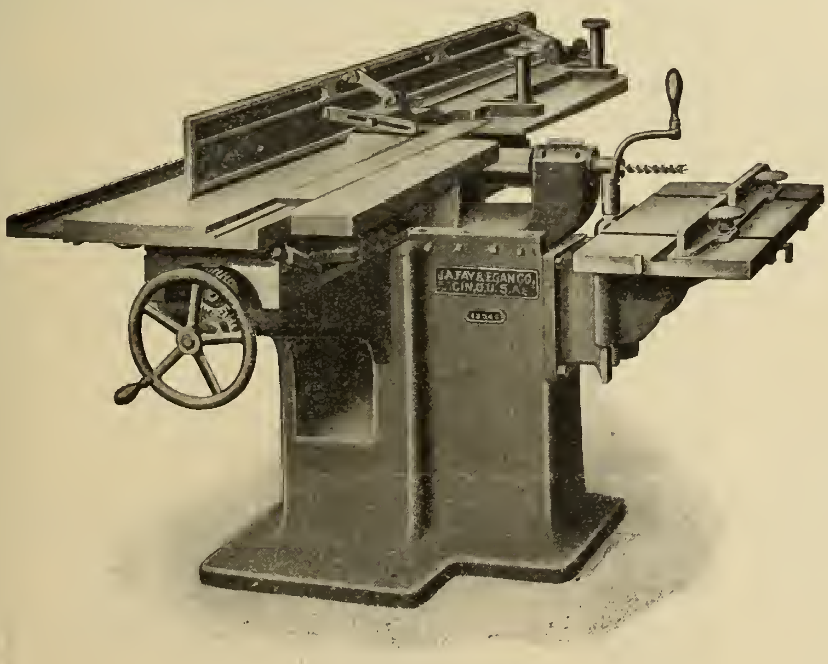

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ARE YOU LOOKING FOR A MACHINE THAT WILL

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WE GUARANTEE THIS MACHINE TO DO THE ABOVE VARIETY OF WORK IN A FIRST-CLASS MANNER

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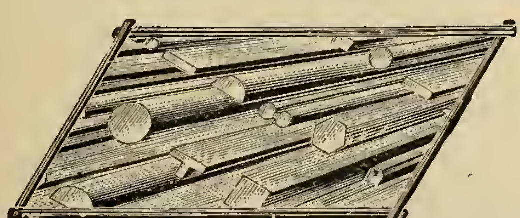

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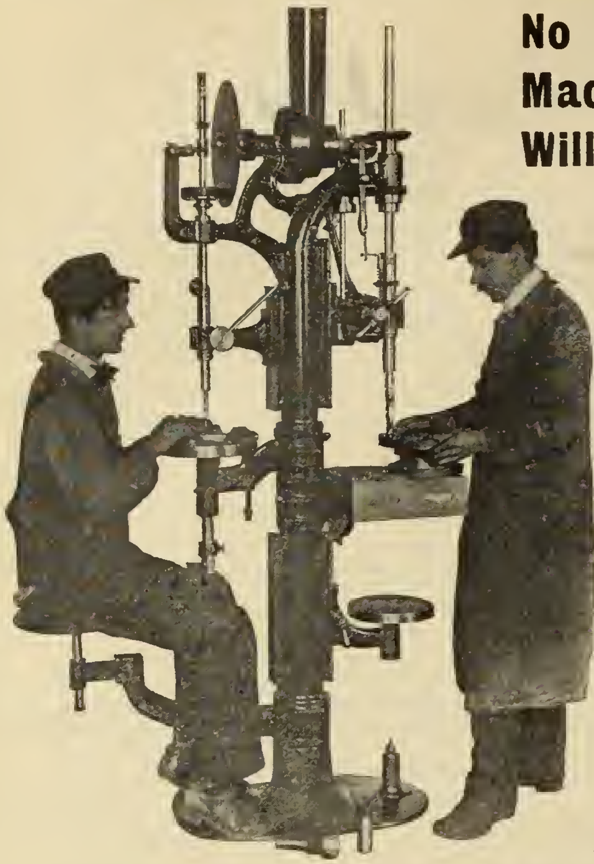

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An ingenious and high-grade machine.

Both sides independent.

One side, sensitive drill with variable speed friction drive. Capacity up to 7/16 inches.

Other side, regular power or hand feed drill. Capacity up to 1 inch.

Removable seat to be used on either side if desired.

Knee feed drill, sensitive drill, manufacturers' drill. It's all there.

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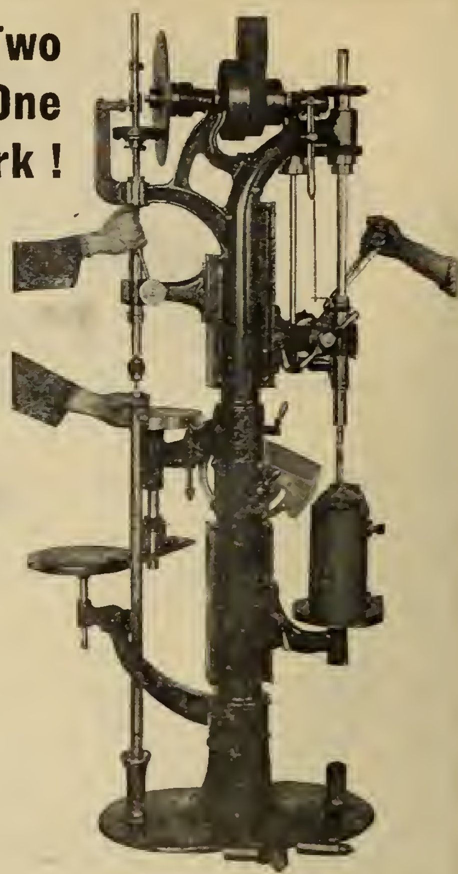

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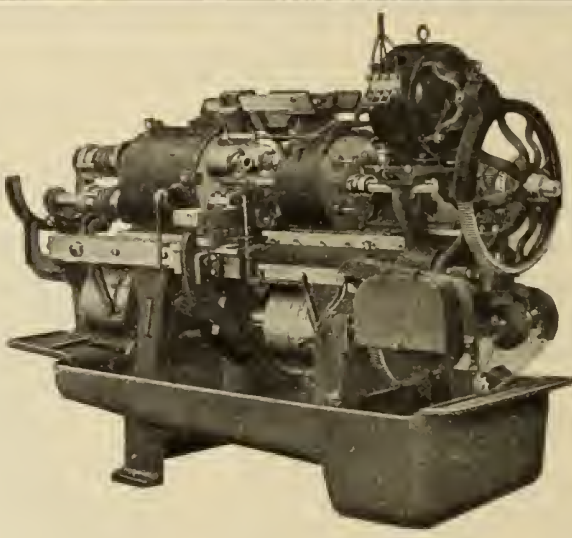
The Greater The Economy

NAMCO



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The Acme Automatic Multiple Spindle Screw Machine

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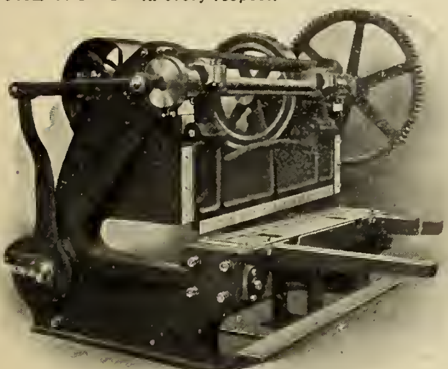

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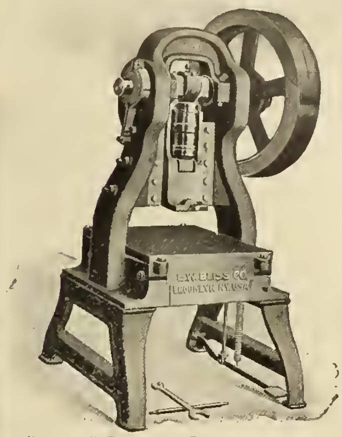

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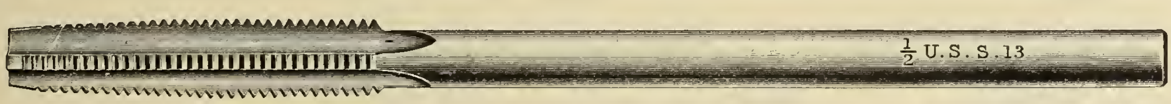

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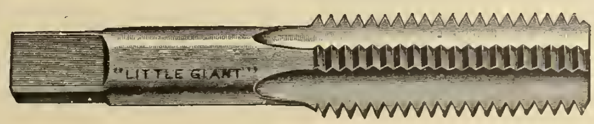

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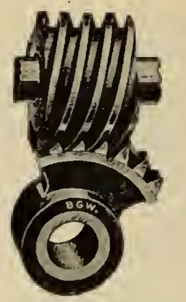

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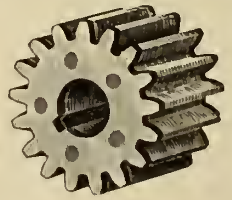

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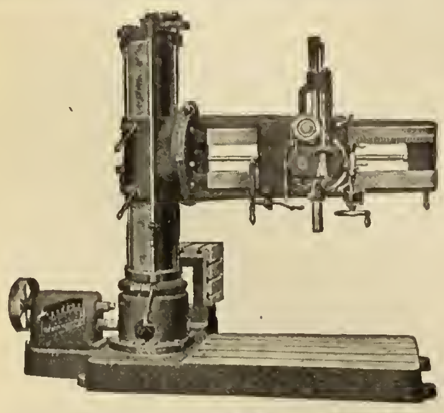

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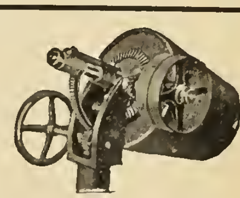

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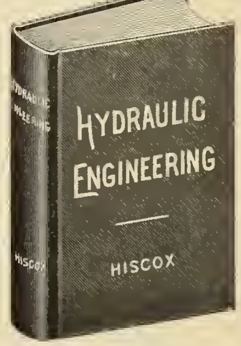

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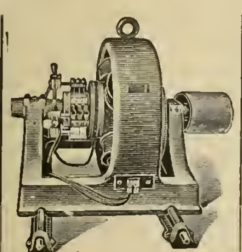

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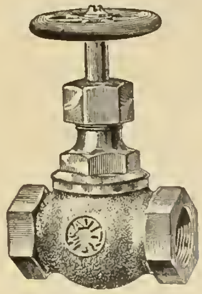

FIG. 2

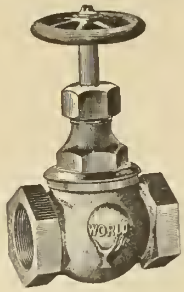

FIG. 4.

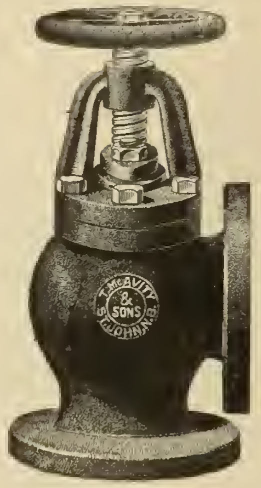

FIG. 134.

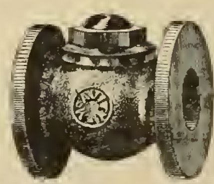

FIG. 46.

FIG. 145.

FIG. 52.

FIG. 100.

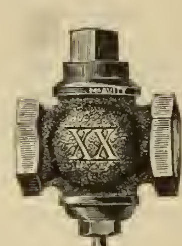

FIG. 90.

FIG. 102.

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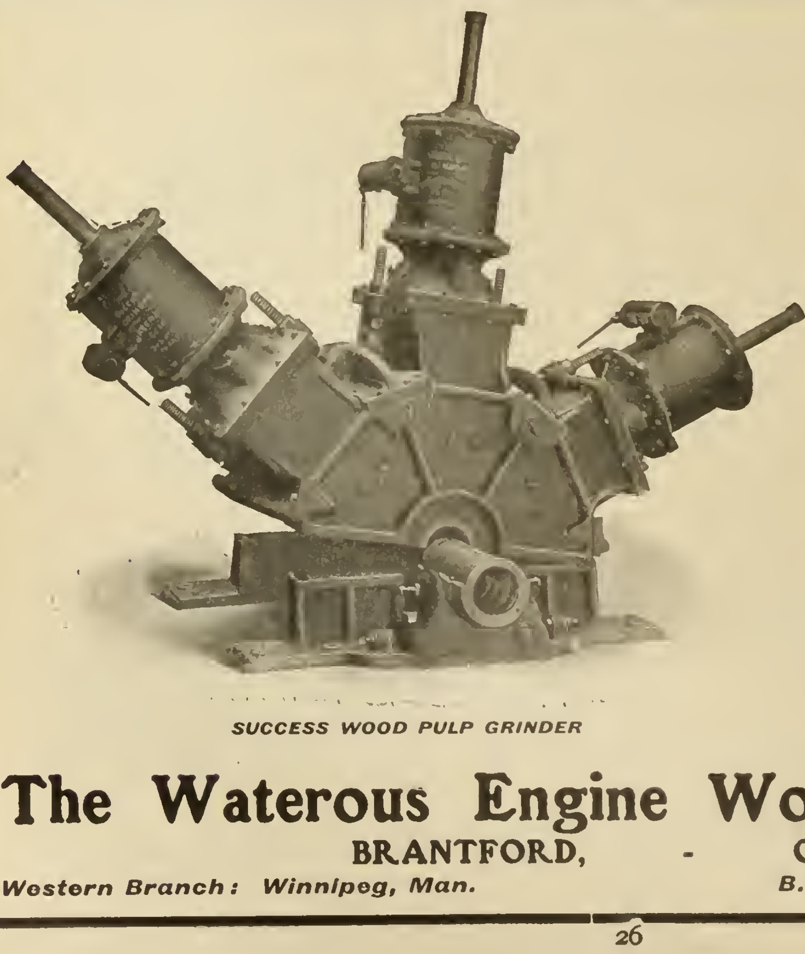

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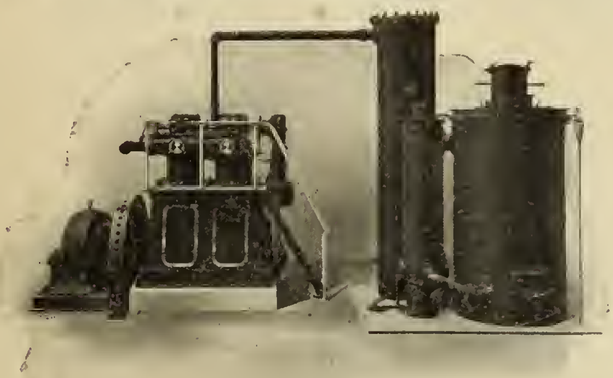

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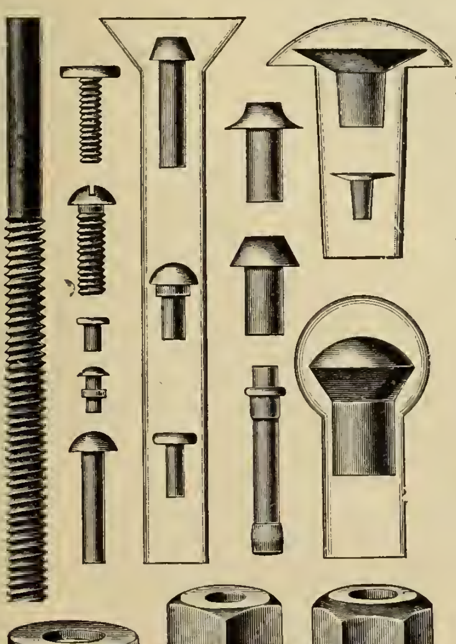

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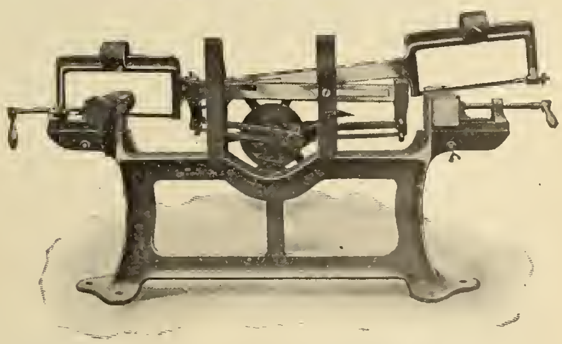

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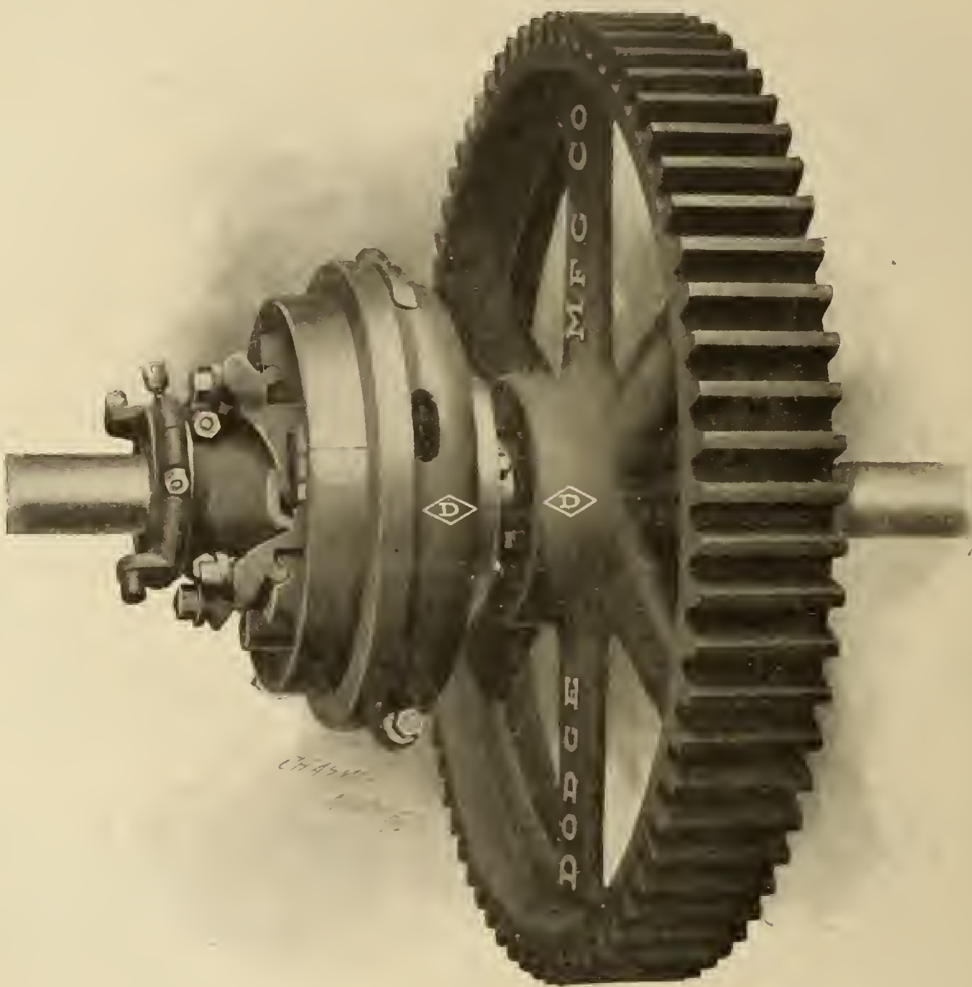

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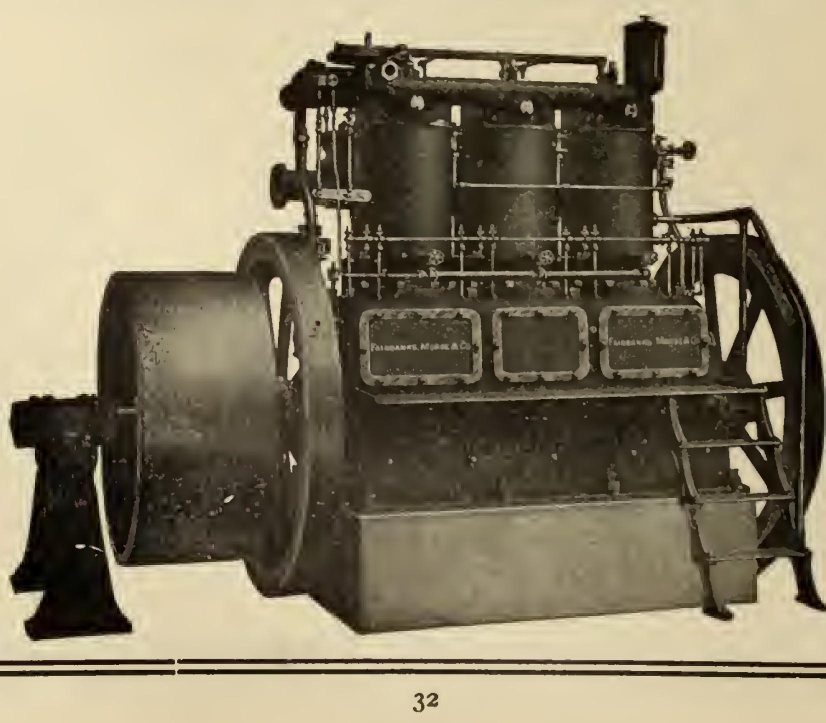


The Vertical Boring Mill, Its Origin and Development

How the Awakening of Gigantic Enterprises Created the Necessity for a Machine to Handle Work which was too Much for the Lathe—Development of the Vertical Boring Mill to its Modern Perfection.

By J. H. VAN YORX.

Reviewing past experience in boring mill development, by the light of modern practice in building metal working machinery, we regard the early days of the lathe, previous to the conception of the idea of boring and turning mills, as days of simplicity and straightforward designs. The requirements were few, and the necessity for complicated machines, as we have them to-day, were as yet undreamed of. A lathe of simple construction was ample to handle all work possible of being turned. Turning tools were made of qualities of tool steel capable of turning off light chips at a surface speed of from ten to twenty feet per minute, which was considered satisfactory.

Most of us can remember when it was a perfectly legitimate proposition, in some shops, for a workman to start a piece of work in the good old way, get his pipe, fill and light it, and if he was so situated, and so disposed, draw himself up into a window, there to doze and smoke for a more or less extended period of time before he was obliged to start a new cut or remove the piece.

Arising of Problems Too Great for Lathe.

New discoveries and the awakening of gigantic enterprises caused inventors to depart from the regularly beaten paths, and the manufacturer soon came to a fuller realization of the possibilities of the transfer from the laborious, time-absorbing work of human hands to the more certain care of machines. Changes and new designs thus brought about resulted in complicated and numerous intricate parts requiring entirely new classes of machinery. Still all kinds of machine parts, which could be brought to a finish by revolving them against a tool, continue to be turned on a lathe. These new parts, from time to time, as changes took place, became heavier in weight and more irregular in design, and the task of machining them became problematical. When a piece of this kind had apparently been secured to the faceplate of a lathe in a horizontal position, this position often shifted, causing annoyance and loss of time if not the loss of the piece entirely. The weight as well as the thrust and strains of machining such pieces soon made frequent repairs necessary to keep the lathe anywhere within working alignment.

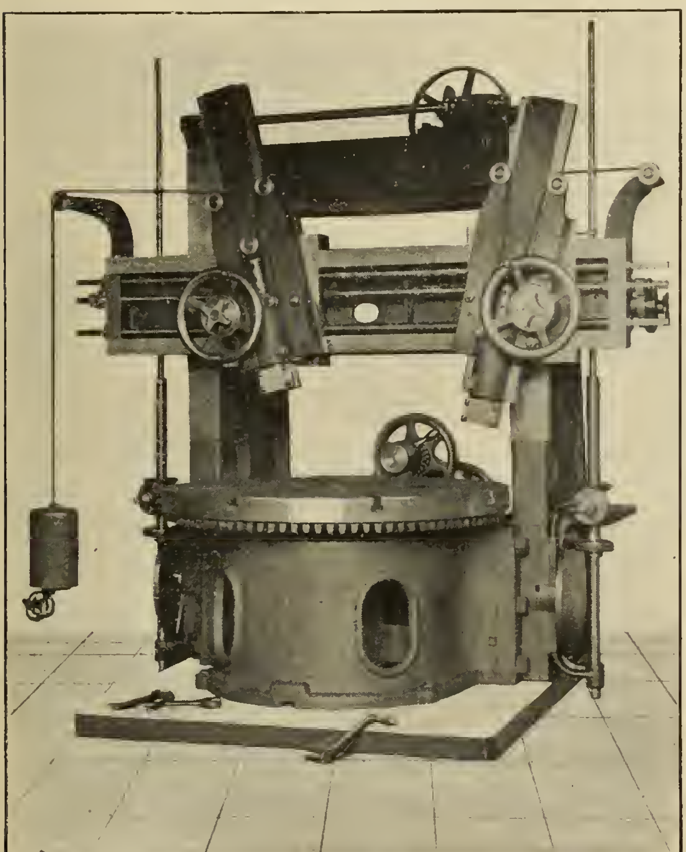


Fig. 2.—Sixty-inch Mill, With Fractional Feeds and Independent Heads.

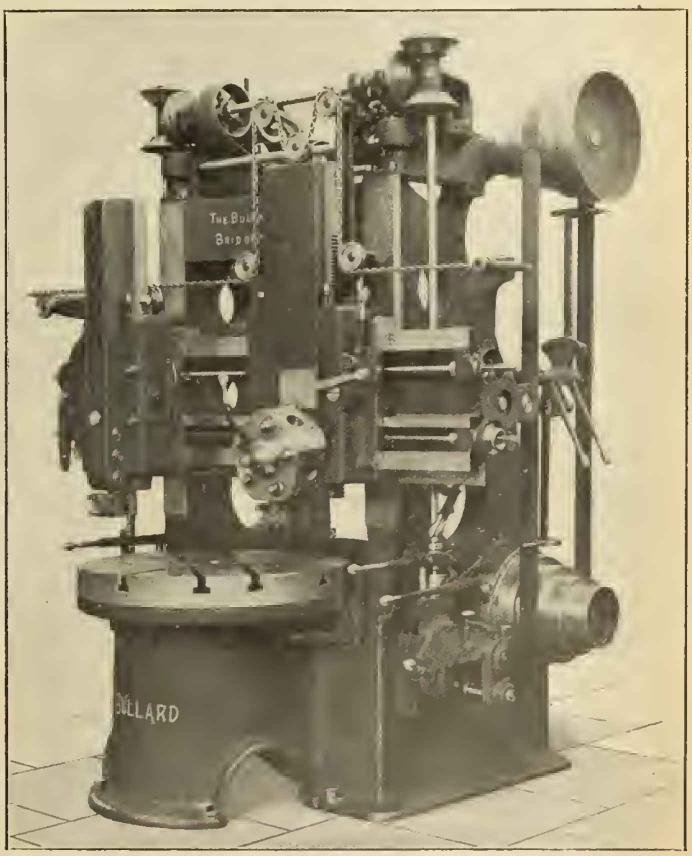


Fig. 3.—Forty-two-inch Mill, with One Swing and One Turret Head.

The bearings which carried these weights were necessarily of limited size and diameter, therefore, the wear was concentrated and not properly distributed. Also, the wear always being on one side, had a constant tendency to destroy the alignment of the spindle. This rendered accuracy and rapidity at the same time, on work of this nature,

a practical impossibility. The problem became a weighty one for the manager. The lathe-maker turned every stone to overcome the new difficulties as they arose, but his efforts finally began to end only in complications of design, without producing the results which the manufacturer of a rapid production type of machine was obliged to have. Rapidity and accuracy without excessive expense were the absolute demands of the times.

It soon became evident that the lathe was being forced beyond the limit of its capacity to produce that which was distinctly the work of another class of machine.

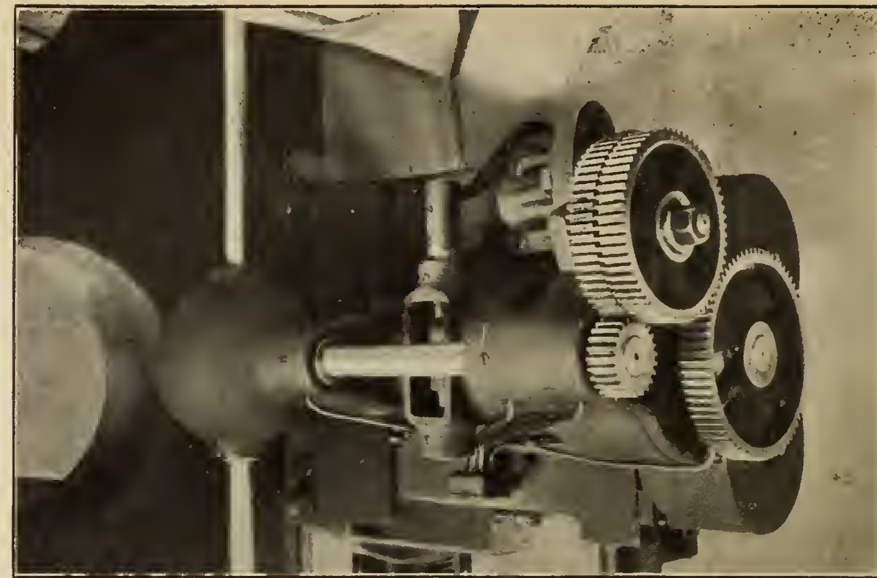


Fig. 4.—Thread-cutting Attachment and Method of Oiling.

Advent of the Vertical Boring Mill.

About this time one of the lathe manufacturers, Mr. E. P. Bullard, who at the time of his demise in December, 1906, was president of the Bullard Machine Tool Co., realized the necessity for a machine of another form which could be handled to better advantage and at the same time possess all the qualities and accuracy of the lathe.

He, therefore, set to work on the idea of inverting the lathe in the form of a boring mill to be used for these purposes. While a boring mill was not unheard of at that time, they were built only in large sizes, and were more for the purpose of saving the expenditure of capital which would be necessary to build lathes of excessive dimensions, rather than to meet a manufacturing need or condition. At this time, too, a boring mill was not considered a machine capable of doing anything but rough work.

Thus the boring and turning mill, as we now know it, was evolved through the necessity of a machine capable of handling short, heavy or irregular pieces of work under conditions already mentioned. A tool was built upon these ideas, experimented upon and perfected, as far as the needs of the times demanded, and a 37-inch mill, as illustrated in Fig. 1, was put upon the market.

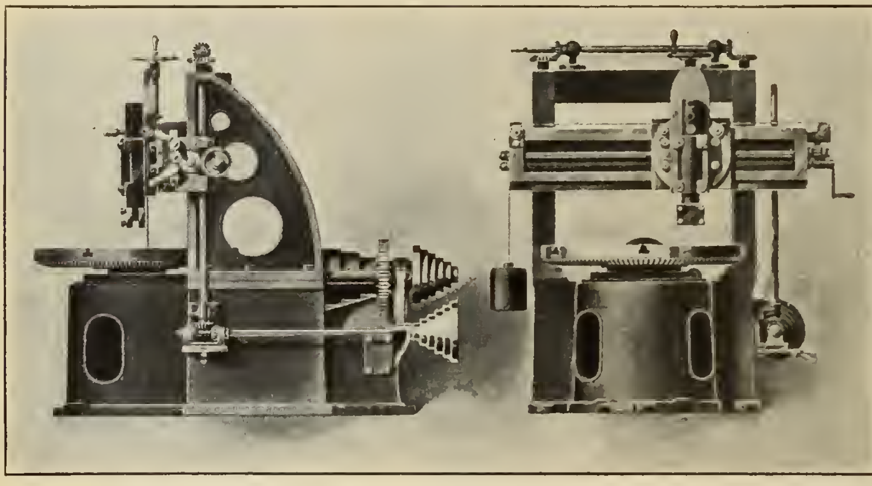


Fig. 1.—Thirty-seven-inch Boring and Turning Mill.

These machines were received very skeptically by the manufacturers because of the universally held opinion that they could not be made to do accurate work. Then followed a long uphill fight, lasting for years to overcome this impression so firmly imbedded in the minds of the machine tool users. Demonstrations were necessary; for anyone might say what a machine could do, but it was another thing to "produce the goods." Here and there some of the more progressive manufacturers of machinery began to investigate, and one by one they became converted. Upon their superiority for certain classes of work being proved, a rapid change of sentiment took place, and they were finally regarded as the highest development of a tool for work of a boring and turning nature.

The heavier the piece to be machined and the more irregular was it in form, the more apparent became the advantage of the vertical boring mill as compared to the lathe, for it is manifestly easier to "lay a piece down than hang it up," and in many cases the piece could be completely machined in a boring mill in the time taken to secure on the face plate of a lathe.

The problem of maintaining alignment was also solved by the change from the horizontal to the vertical construction, for the largest bearing possible in a lathe could be multiplied many times in area under the new conditions, consequently the weight of a piece to be machined need no longer be considered.

Greater production being possible owing to the ease of securing the work, attention was naturally drawn to the details of the operating mechanism and such changes as were made had a decided tendency toward a further reduction in machining time as compared

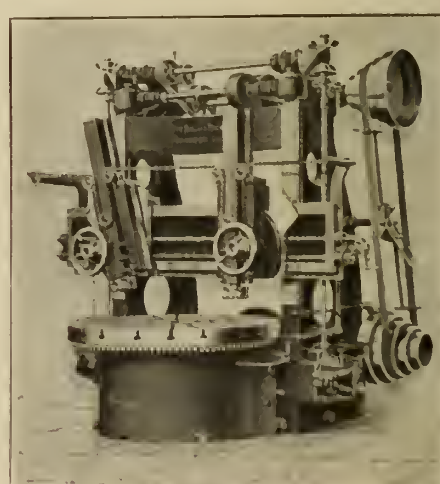


Fig. 5.—Sixty-inch Mill, Showing Brake, Belt, Shifter, Etc.

with the lathe, until the boring and turning mill was conceded by all to be a superior tool for such work as comes within its range.

The young designer of to-day, however, smiles at this, the highest developed machine of its kind at that time, as perhaps his successor may at some fu-

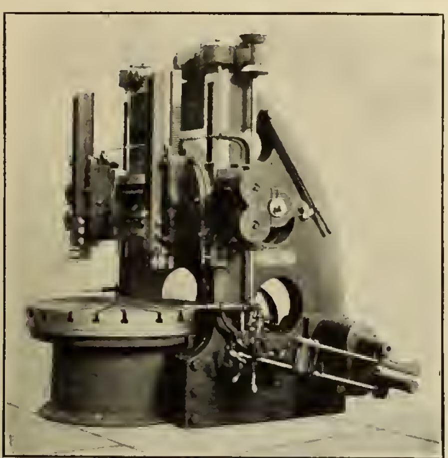


Fig. 6.—Showing the Speed Box and Method of Operating.

ture time smile in turn at the highest developed machine of his design. It, however, "filled the bill" until conditions changed. It weighed somewhere between five and six thousand pounds, had a single head similar to the compound rest of an engine lathe with a hand-wheel for down feeds located on top of the head. The feed works consisted of some six or eight gears with connecting rods, belt driven on cone

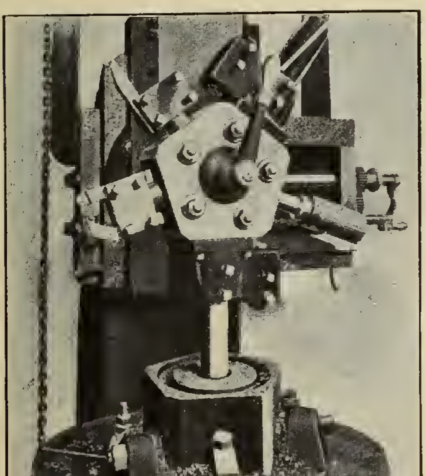


Fig. 8.—Machining a Turret Head in a 30-in. Boring Mill.

pulleys, having six changes. The head was operated by hand. As indicated by its weight, the construction was very light, although heavy for the day.

Developments in the Vertical Boring Mill.

The final placing of these tools in the machine shops opened a new field, and their manufacture was taken up all over the manufacturing world. The market became still further advanced and insistent in its demands as natural resources were developed upon a scale and along lines hitherto unheard of. Slow speeds and feeds in machining work, and awkwardness in handling caused vexatious delays in putting machinery into the hands of the customers. The demands were satisfied all too slowly.

About this time the double-head machine was developed, which greatly increased the output over that of the single-head machines, but the feeds were operated by friction drive from one side were not independent as they are today, and the construction was still light.

A later development of this mill gave independent feeds for each head, although still operated by frictions. See Fig. 2. This possibility of using two heads independently was equivalent to operating two machines at the same time upon the same piece of work. An added impulse was given to the desire for rapid production.

It became almost a mania to increase feeds and speeds, and to perform work cheaply and quickly by reducing machining time. Shop men and mechanics exchanged stories of the number of feet and pounds of metal turned off in their respective shops. It was not long before the power of the machines exceeded the capabilities of the tool steels used in making the cutting tools. To withstand this forcing process new steels were invented to meet the new conditions, but very soon the machines had again advanced beyond the new steels. At each step forward taken in producing new steels it became necessary to build machines which would withstand all that the new tools were capable of. In this way the boring mill became heavier in design. Wide faced, heavier pitched gearing replaced those of lighter design, and where extra strains and wearing qualities demanded, steel and bronze were used in construction. Motors were added for mills to be used in electrically driven shops.

Style of Improvements in Last Few Years.

This process continued until a few years ago when the advance in steels to withstand excessive strain and work seems to have reached a limit, temporarily perhaps. A machine tool builder seldom put through his works two lots of the same size machine which were identical in design. This cession in the continued increase of cutting feeds and speeds, for a time at least, put a stop to decreasing the machining or cutting-time on work. Since then the new designing has been toward the quick handling of the work and the machine from one operation to another for it is realized that where the time is now lost is during the periods in which the machine is not actually cutting. To do

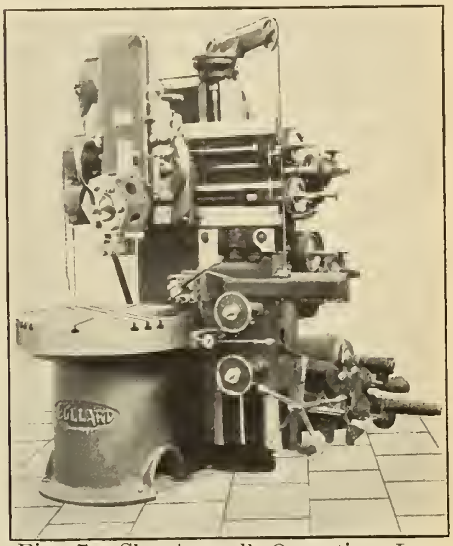


Fig. 7.—Showing all Operating Levers Within Easy Reach of Operator.

rapid work time must now be cut between operations.

It will be interesting to note in Fig. 3 the progress which has been made thus far in the tool shown in Fig. 1. This machine weighs 14,000 pounds, operates six sets of tools instead of one, has ten changes of speed together with ten changes of feed for each head, and

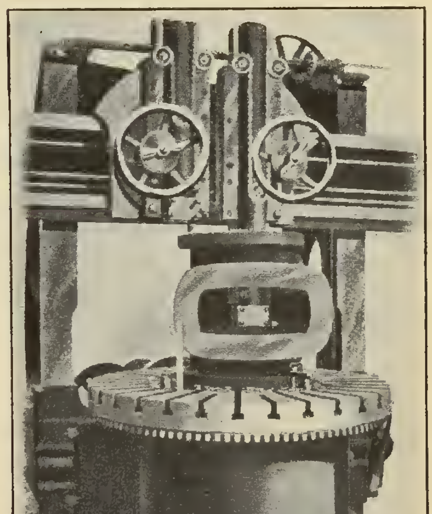


Fig. 9.—Facing and Boring a Valve in a Double Head Boring Mill.

is designed to meet all changes of material from the softest brass to the hardest steel, and the differences in character of work or tool conditions. This mill is equipped with power-handling and thread-cutting devices, and numerous small attachments for accuracy and convenience, not considered as requirements in the early days.

Occasionally during this period in the development of the boring mill, fearsome predictions could be heard that they would become too complicated, and would soon require a mechanical engineer to run one, and the expeuse of all these extra attachments and new designs, steel and bronze gears, would be prohibitive. That these predictions have proven untrue, and that the development has been of a practical nature, is shown by the fact that at the present day these machines can be operated by any intelligent, mechanically inclined person after a short course of instruction. It is true, however, that a workman has much more to think of in operating these machines, yet it is more the expensively produced parts and reduce their cost from dollars to cents.

Within recent years another radical change came about, this time forestalling the advance of machine-shop conditions. It was to anticipate a situation very similar to that which brought forth the first boring mill. As originally, with the lathe, the ever-broadening class of work which a regular boring mill was called upon to do had outgrown in a comparatively short period of time the machine on which they were doue, and the boring mill manufacturer was called upon to meet the new situation.

In this departure, however, the manufacturer kept ahead of the conditions instead of following them, and is now together with a few of the more important improvements which have been added from time to time and some of their work. One of the first requirements was a means of cutting threads and an attachment was added which at first was somewhat limited in scope, but at the present time thread-cutting operations may be as economically done as any other. Fig. 4 shows a thread-cutting attachment as applied to a 54-inch mill.

This was followed by the need of a brake which would stop the machine quickly and not have to let it "die out," or risk the operator's hands and life in bringing it to a stop. Fig. 5 shows a brake of this nature together

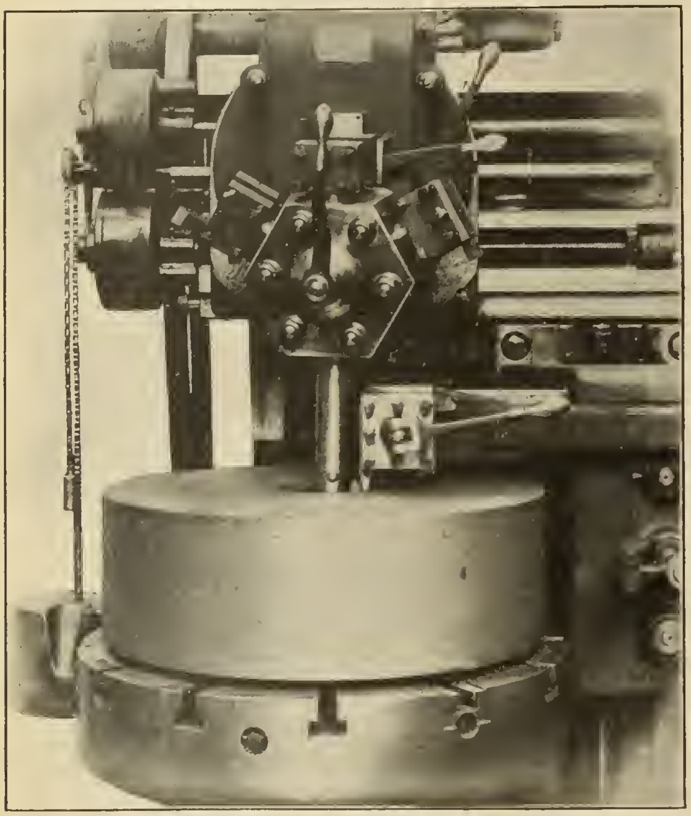


Fig. 10.—Working Two Tools in Close Proximity.

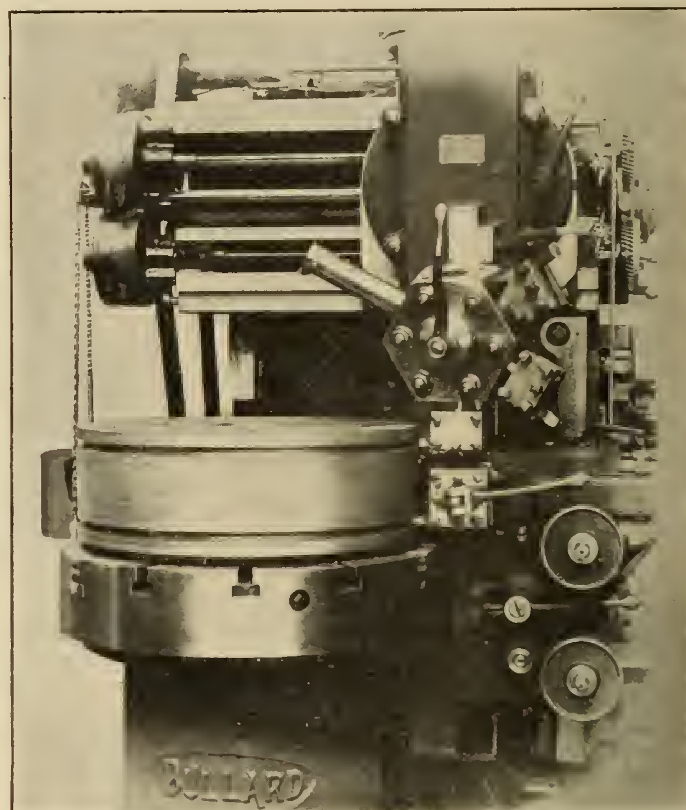


Fig. 11.—Thirty-six-inch Vertical Turr et Lathe, Machining Piston Heads.

a multiplicity of simple attachments rather than a complicatiou of intricate parts which make them up and they are never all operated at the same moment. His muscular efforts have been changed to brain control, aud the machine does the work.

Contrary to the expectatious of excessive cost, these machines may be purchased for practically the same price, or less, in some cases hundreds of dollars less than at that time. While this was due to a certain extent to the fact that machine tools were under-going improvements and contributing to the lower cost of production, yet improved boring mills entered into this to a very great extent because they could handle ready to meet the demands as they are presented. He has developed the boring mill into a vertical turret lathe, as the lathe was developed into a boring mill. Of any future development there is as yet no indication, as the vertical turret lathe is the latest product intended to to meet the latest known conditions.

The lathe has it's province, likewise the boring mill, and while they may overlap in certain capacities yet they are distinct. The vertical turret lathe, while filling additional requirements beyond the lathe and boring mill, still covers a large proportion of them both.

It might be well at this time to give an idea of modern boring mills as developed by this process of evolution, with belt-shifter aud power-haudling as applied to a 51-inch mill. The two latter became obligatory as the machiue became heavier and the belts larger, making hand-labor not only prohibitive from the necessity of consuming the muscular energy of the operator in unproductive labor, but also from a safety standpoint. This, however, did not long cover the new demauds for rapidity and couvenience, so speed boxes were added with their quick chauges uuder full load, and the power of stoppiug the table instantly at any predetermined point. See Fig. 6.

By this time there was a prospect that the handles and levers would begin to bristle out in all directions and a

new problem of operation became insistent. The workman was threatened with losing some of the time gained by the operation of some of these time-saving devices in getting hold of the levers which would put them in operation. The next move then was to bring these attachments and levers into such relation with the operator that he would have them all within easy reach. In other words, that a machine could be handled from a "two-foot space." This was accomplished. Fig. 7 will show one of the ways in which this was done.

As the quantity of the manufacturer's product increased and the production of large numbers of duplicate and interchangeable pieces became a part of their methods, much time was lost by the operator "in getting his sizes," effort a method has been finally adopted which for simplicity is almost amusing after looking over some of the complicated tripping devices which even today some of the makers persist in putting on the market. Fig. 6 shows a set of graduated micrometer dials for the cross and down feeds of both main and side heads illustrated. The ones for the main head are on the cross and down feed worms at the right end of the rail. The ones for the side head can easily be seen in the illustration. They are provided with numbered pointers corresponding to the numbers on the turret faces, and these can be set to a nicety for each tool used for the several operations. Worn parts and back lashes have no effect. The machines are all provided with safety devices, and can easily be filled with pictures showing the great varieties of work, but as space will not permit, a few will be presented showing to a limited extent the adaptability of some of the machines to working conditions rather than attempt to show the diversified nature of the work which can be performed.

Fig. 8 shows a 30-inch mill with a standard tool equipment machining a turret head in a fixture. The accessories have much to do with the rapid and accurate production of work. Fig. 9 illustrates a double head machine with the right-hand head dropped into, and boring a valve, while the left-hand head is facing. The time for facing in this case is clear gain. Figs. 10 and 11 show the possibilities of working the

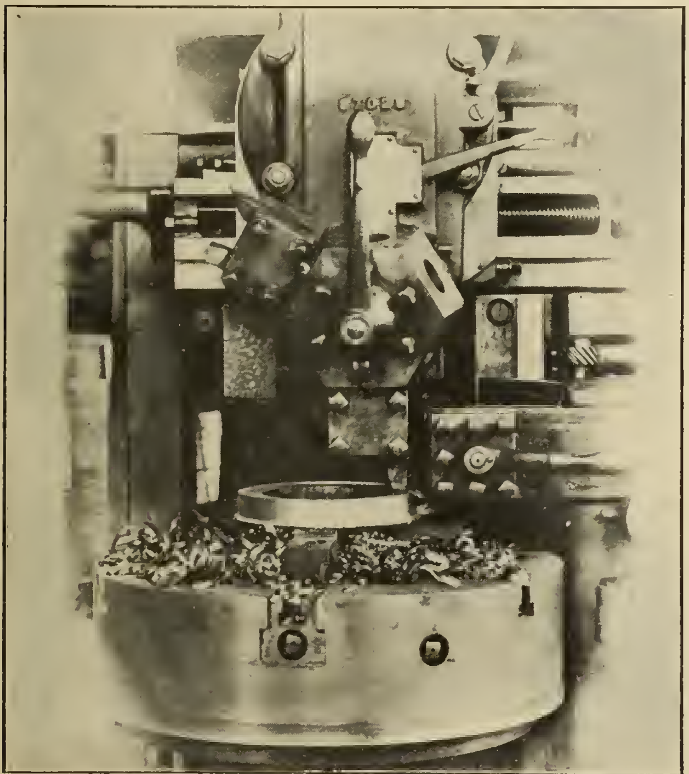


Fig. 12.—Machining High Carbon Steel Forgings.

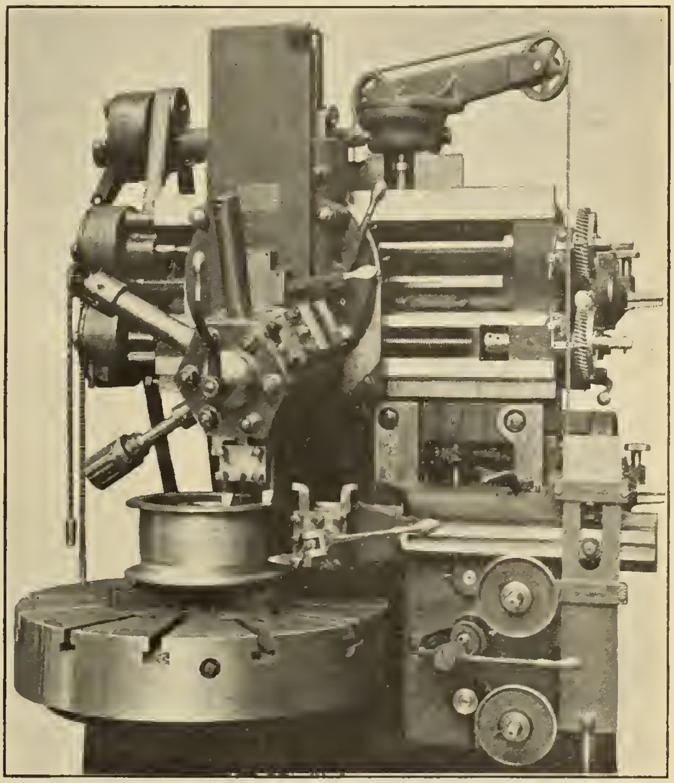


Fig. 13.—Showing Forming Attachment in Operation.

actually getting them within the limit of what might be reasonably called duplicate sizes. It left too much to the skill and "feel" of the operator, to say nothing of the time lost to caliper or "mick" each piece.

Boring mill manufacturers set to work on all kinds of trip mechanisms which, without a single instance, have proven an absolute failure. There are special cases in which they have been kept in use where exactness was not a particular object, or where they have been used as safety devices. A few, which were reasonably accurate when they were new, became inaccurate and unused after a short service, due to wear, back lashes etc. After all this to have an expensive tripping device of more or less uncertainty for this purpose is superfluous.

Some Work Done on Vertical Boring Machines.

It would be, of course, a waste of time to enter into a portrayal of the advantages of the boring mill over the lathe for large classes of work, as its superiority has become an axiom among all up-to-date machine builders, but it is only natural that a mechanic would like to see what a machine can really do after he has been told about it. A machine in operation cannot be presented to the reader, but photographs of machines in operation can. A volume two heads of a modern vertical turret lathe close together in any position, and yet have no interference. This non-interfering quality admits the use of both heads instead of leaving one idle while the other is forced to do all of the work, in double the time. It should be remembered that any time during the operation of a double head mill in which one of the heads is idle, the machine becomes for that time virtually a single-head mill. Fig. 12 shows both heads of a vertical turret lathe taking heavy cuts on a very high carbon, light weight, steel forging, a class of work usually difficult to handle with satisfactory results. Fig. 13 illustrates

a forming attachment in operation. This has solved a problem which has been vexations for more than lathe and boring mill builders.

In solving these vexatious problems new attachments were added to the mill which in time became essential parts of the machine itself, and the size scope and appearance become changed so that the boring mill of yesterday is not the boring mill of to-day; the boring mill of to-day will probably not be the boring mill of to-morrow, and perhaps it will not be a boring mill any more than the vertical turret lathe is a lathe as we ordinarily consider one.

If Franklin was taken into the press room of a modern printing establishment or one of our enormous generating plants when they were in full operation, we doubt if he would have the faintest idea of what was being done. New discoveries and new inventions must be followed by new machines, and the machine manufacturer must be the first to follow the march of progress or not be in the procession at all.

New Dill Variable Speed Mechanism for Machine Tool Drive

Something Quite Different in the Way of a Speed Change Box, Gotten out by T. C. Dill Machine Co., Which Will Give a Very Wide Range of Speeds.

The Dill drive, shown in Figs. 1 and 2, is a new variable speed mechanism by which almost any range of speeds can be obtained and any variation within its range, and which promises high efficiency. It is composed of two series of hardened thin steel discs connecting two shafts; one of the series are flat and intermesh with the series of the discs that have taper sides. All have square holes fitted loosely to square shafts and are maintained at right angles to the shafts by two heavy cast iron discs on one of the shafts; one of which is fixed rigidly to the shaft, while the other has a long hub and has a lateral movement on the said shaft. A coil spring presses these discs together with all the steel discs in their group, keeping the discs of each series in mutual contact with each other. The points of contact of the flat discs are always on the periphery edges, while the points of contact on the taper discs vary along their entire faces. The speed is changed by bringing the two series of the group more deeply into mesh or vice versa, thus changing the contact points on the taper discs.

The contact between the flat and the taper discs is but a point; and as the discs have a rolling action upon each other, the frictional resistance is reduced to a minimum. Great power with exceptional endurance is arrived at by first determining the proper pressure (from the viewpoint of endurance) for one disc and then adding discs sufficient to the amount of power required. The tension of the spring upon the discs is adjusted to suit the load at a given speed. As the speed is increased, the pressure is reduced and vice versa. Constant horse-power is attained by so constructing the spring that its tension will vary with the speed, due to the difference in thickness of the taper discs; as the flat discs approach near the centre the taper discs are the thickest, the spring is forced back and thus made stronger when the speed is slower; by designing this spring the proper length and size, the difference in strength may be in the same proportion as the variation in speed, which results in constant horse-power.

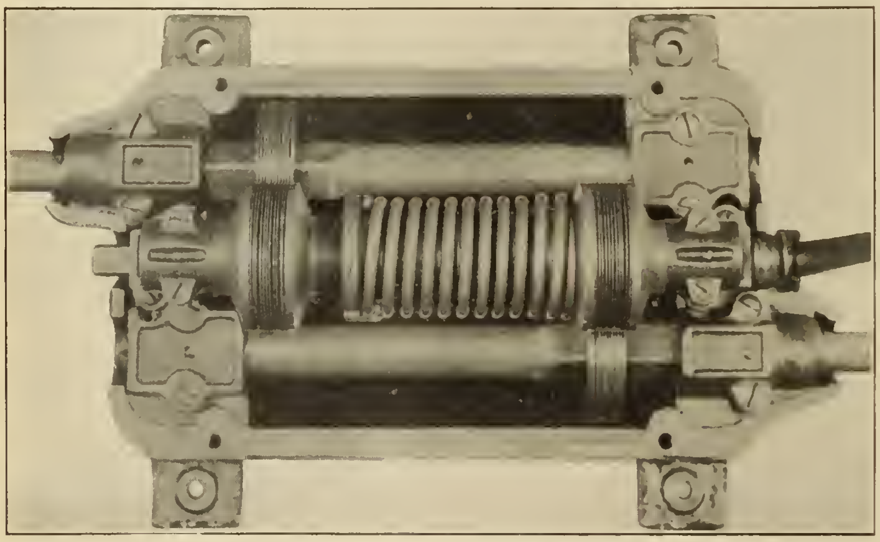


Fig. 1—Dill Variable Speed Mechanism.

Three shafts and four series of discs in two groups are used in the style illustrated. In order to give a large range of speeds with small discs and permit the driving and the driven shafts to have fixed centres, it may be so designed as to make the receiving or constant speed shaft the high speed, with all variations of speed being a reduction; or to make the constant speed shaft the medium speed; that is with the minimum and maximum speed of the variable speed shaft lower and higher than the constant speed shaft. This former style of drive we believe to be admirably adapted to be built in the head stock of a lathe or boring mill. Figs. 3 and 4 show the variable speed mechanism as applied to a 20-inch lathe. A range of speeds of 30 to 1 and, of course, any speed within this range may be obtained, and is admirably adapted to be connected with the slide rest of the lathe in such a manner as to automatically obtain the proper cutting speed regardless of the diameter of the work. This is clearly shown in the two figures.

The flat discs fitted directly to the spindle are 14 inches in diameter, meshing with the taper discs of their group on the intermediate shaft 12 inches in diameter; on the other end of the intermediate shaft we have another series of flat discs of 12 inches in diameter which intermesh with the taper discs on the constant speed shaft which are also 12 inches in diameter. The points of contact of the taper discs will vary from the full diameter to near the diameter of the shafts. A sufficient amount

of power may be obtained by using but a smaller number of discs.

The lathe, Figs. 3 and 4, is of a standard make, with simply a larger pulley with double the face, slipped over the original cone. A rocker shaft is fitted on the back of the lathe and connected to the countershaft by a rod, and is connected to the slide rest by a notched piece dropping over a pin in a lever, which is clamped to the hub of a lever provided for changing the speed by hand in such a manner as to slip when a given amount of force is brought to bear; thus avoiding accident to the automatic device, yet permitting operation by hand. This hand lever is keyed to the rocker shaft so as to have longitudinal movement on same, also fitted to the carriage of the lathe so as to be convenient to the operator. A similar automatic arrangement is intended for drives built in the head stock of a lathe; of course the countershaft, as shown, made by a suitable lever, and still retain many of its desirable features, such as a wide belt on a large diameter pulley at all times, which means more power; and instantaneous speed changing to any speed within its range.

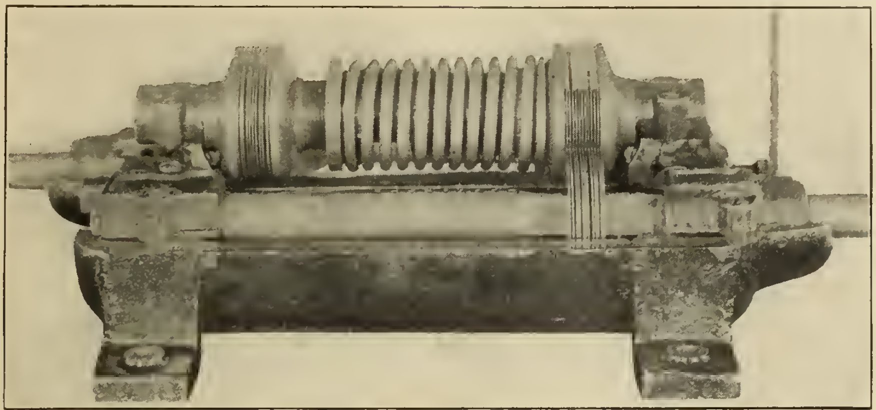


Fig. 2—Dill Variable Speed Mechanism.

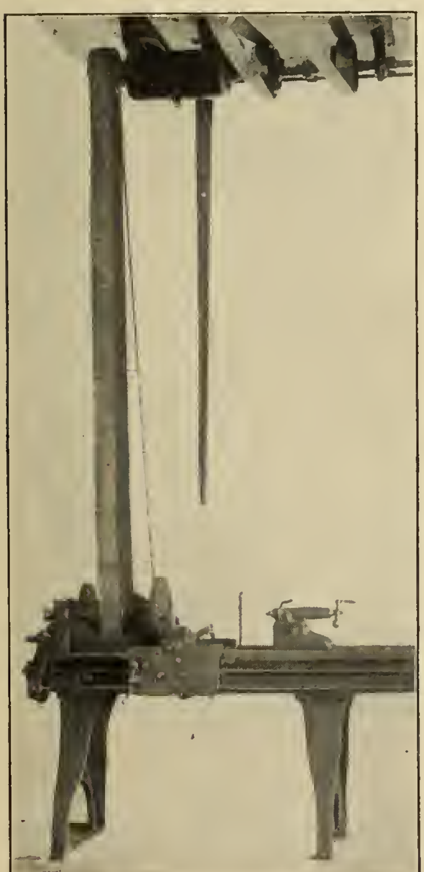


Fig. 3.—Speed Device Used as Countershaft.

Figs. 1 and 2 are of the drive we are putting on the market as a countershaft or speed box for general use. We are making these in several sizes ranging from one-half horse-power up, with a speed range of five to one, although more or less can be had if desired. In this drive, the taper discs are all on the intermediate shaft together with their heavy cast discs and springs; constant horse-power is obtained throughout the speed range by the same principle as already explained. The speed of the constant speed shafts is midway between the minimum and the maximum speed of the variable speed shaft; thus giving a medium initial speed.

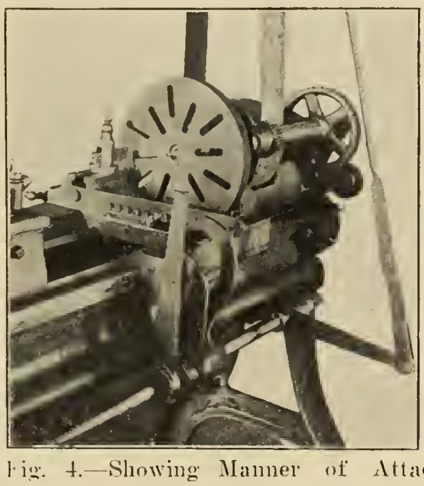


Fig. 4.—Showing Manner of Attachment to Lathe.

The frame of the drive shown is suitable for five horse-power, is but 23 inches long and 15 inches wide over all, including the extension for the feet and bearings; the frame proper is only 19 inches long by 11 inches wide and 9 inches high. The discs are 4 inches in diameter and 3-64-inch. thick; the speed of the constant speed shaft is 400 r.p.m.

The frame is so designed as to entirely enclose the mechanism which runs in an oil bath, and is equally suitable for the floor or ceiling and may be operated with a lever, chain, or rope as desired.

The mechanism is being placed on the market by T. C. Dill Machine Co., Philadelphia.

PRACTICAL QUESTIONS AND ANSWERS.

Babbit Metals.

Ques.—What is the composition of babbit metals?

Ans.—For slow running journals under a moderate load, pure zinc is sometimes used as a babbit, and it wears well but on account of the great shrinkage in cooling it loosens and cannot be held firmly. For high-speed, however, zinc cannot be used as it does not contain the anti-friction qualities necessary for a high-speed bearing. To overcome the shrinkage of the zinc block-tin is sometimes used in the proportion of 8 parts zinc to 2 parts block tin. This mixture makes a babbit which will resist the force of a heavy load, but can be used on bearings and work where the speed is not over 300 to 400 revolutions per minute.

Lead contains all the anti-friction qualities for a babbit metal, but on account of its softness, it cannot be retained in the bearings. Lead and antimony combine without impairing the anti-friction properties of either of them, and this metal wears well in a light, fast-running journal. The antimony hardens the lead and a composition of 20 parts antimony and 80 parts lead stands high speeds, wears well, has no shrinkage and has very great anti-friction qualities and is best adapted to high-speed machinery.

One of the best metals now in use for lining journals subject to high speed and heavy weights is one in which tin, copper and antimony are the ingredients and this is the real babbit metal. It consists of 50 parts tin, 2 parts copper and 4 parts antimony, which is 89.3 per cent. tin, 3.6 copper and 7.1 antimony.

Suggestions for the Executive in the Art of Handling Men

Necessary Qualification in a Good Executive—Pointers for Managers, Superintendents and Foremen from an Experienced Man—Instances where Lack of this Art Resulted in Ruin.

By R. H. WADSWORTH

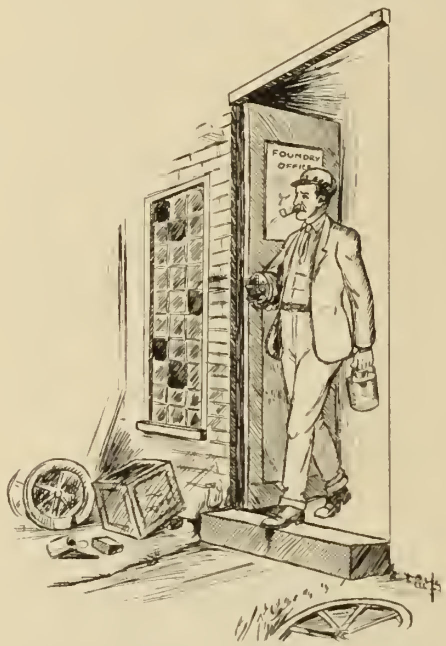
Men in official positions exhibit a marked divergence of opinion regarding the attitude of an executive toward his men. Those who are most successful agree in many points on which those less successful are at variance. In these days when we are seeking to obtain the highest efficiency everywhere, a discussion of this subject would seem to be in order. In this discussion the word executive will be used to mean every man in the shop who is authorized to direct the efforts of those about him.

Necessary Characteristics of a Good Executive.

Some men are born executives, some by training make good executives, and others are hopeless. For the one who aspires to be a successful executive a generous supply of common sense and intelligence are first essential, and, second, a thorough knowledge of the subject in hand; then he will be erect, neat, orderly, systematic, and will avoid profanity, vulgarity and the disrespectful or unkind mention of others. He will, as far as possible, give a positive decision when required, and adhere to it till it is obviously wrong; having made a mistake thus he will in the face of abundant proof abandon his decision gracefully and accept the one best indicated by the evidence. He will not permit his judgment and decision to be biased by the source of the information so long as it is reliable; nor will he be slow to accept any proof or decision simply because it was advanced by another. He will be frank, will look a man in the eye and say what he means. To invent an evasion is to discourage respect and confidence. He will be civil; he has no license to be otherwise. He will be agreeable, promoting cheerfulness among the men. Chummy relations with the men in his charge will be avoided, for sometimes an employee will take advantage of this condition to secure favors. To show favors thus is to court the displeasure and criticism of the other men. He may be frank, agreeable and cheerful with his men and yet be known for force and firmness, his words will be few and pointed, and will correspond with his actions. To profess one thing and act another is again to discourage confidence and respect, with the result that the men under his direction will become thoughtless, careless, lose interest in their work and their production will be diminished both in quantity and excellence. He will not treat the men as inferiors, but rather show confidence in them by encouraging their thought and suggestions about the work.

Suggestions Should be Encouraged.

In some cases which have come to the writer's attention, premiums are paid for good suggestions. One company has a mail box in the shop to receive letters of suggestion from any of the men.



"One after another of the men lost his job."

These letters contain suggestions intended first, to improve the design of the product; second, to cheapen its cost of production; third, to improve its quality. They are acknowledged by a cash payment for every valuable suggestion, the payment varying in proportion to its importance or value. In the last few years this company has become a leader in bringing out new and advanced ideas and improvements in its products—lathes.

The aspiring executive will not appear to be spying on his men nor will he circulate frequently among them with the apparent intention to find every possible cause for complaint with their work. Any criticism of the work must be helpful and constructive. In assigning work to his men he will first consider that the man is capable for the work, that material may be had, and that equipment is adequate. Then he takes special care to know that the man thoroughly understands what is wanted. Repetition of important points is in order to emphasize them. A gain is made by using plenty of time to make sure that the workman understands his task; failure on this point has frequently resulted in spoiled work.

Good System is Essential.

System is an absolute essential to success. There may be too much "red tape" in a shop but it is not probable that there will be too much real system. The good executive, then, will conduct the affairs of his department with the utmost system, that means that every order and communication or other information has its place and may be found there instantaneously; and every important move of the product of his department is intelligently noted, giving point of shipment and time. It means that the product of the department will be handled with as little lost motion as possible.

Orders Through Proper Channels.

The order of authority should have mention. No executive should attempt to give orders to men not immediately under his command; if one or more executives intervene instructions should pass through them in due order. Failure to observe this rule is annoying to the executive immediately in charge of the men by disarranging his plans; it puts some uncertainty in the mind of the workman about whom to obey; it causes a loss of time; and by ignoring the executive immediately in charge it indicates a lack of confidence in him and makes him feel dissatisfied.

The whole subject of the relation of executive and laborer may be comprehended briefly thus; that the laborer has a right to expect gentlemanly treatment, honesty and frankness from his executive; he will respond very largely to this treatment by giving respect and honest service in return, and as far as he is not discouraged in so doing will assume an interest in the work, co-operating with the executive to bring about the best production.

Examples From Personal Observation.

In the following paragraphs some examples which have come under the personal observation of the writer will be

given to emphasize some of the foregoing points in their relation to the success of the executive.

The first is a man who comes as a new foreman into a shop building hoisting engines; he succeeds in this position a man who has been a blacksmith by trade, a millwright by later practice, and who has done well in charge of the machine shop. At this juncture, however, his services are desired on the road erecting engines. In a few days a dislike for the new foreman has formed in the minds of many of the men because of his continual insistence that they were doing nothing right and didn't know anything. Following this one after another of the men suddenly lost his job. In the meantime an engine had been finished and it was desired to load it on a car. In two days during which the patience of himself and his men was sorely tried, he loaded the engine on the car, employing from 6 to 25 men at a time on the task. At no time in the work would he accept any suggestions from any man about what would be the best, or even an advisable move. This contrasts with the work of the preceding foreman who encouraged his men to think at their work, who was always agreeable, and who regularly loaded the engines with from 4 to 6 men in half a day. Even though a man may be accredited a good mechanic he neither knows it all nor is past where others can lend to the success of the problem or effort at hand by their thought and suggestion.

A Doctor as Shop Manager.

A second example is taken from a shop into which a young man came not long after having graduated from a medical college. He and his father, then Dean of a medical college in Boston, held considerable stock in the shop, the chief product of which was plows. By discouraging some stockholders and buying up their stock at low prices, and freezing others to sell at reduced rates they came into possession of a major part of the stock and so controlled the affairs of the company. One victim was their foundryman, a very capable man as a founder, and every inch a gentleman. So the young doctor advertised for a new foundry foreman. An applicant for the position was asked to take charge of the moulders, about 40, and nearly all local men of very limited experience, to look after the sorting and breaking up of the scrap for the cupola, to give personal attention to the work in the core shop, to look after about 8 furnaces heating strap iron for formers and multiple punches, and to spend his spare time running a punch.

The doctor-manager said further: "You will not need to give any attention to the cupola; I attend to the mixing of charges and direct the handling of the cupola myself."

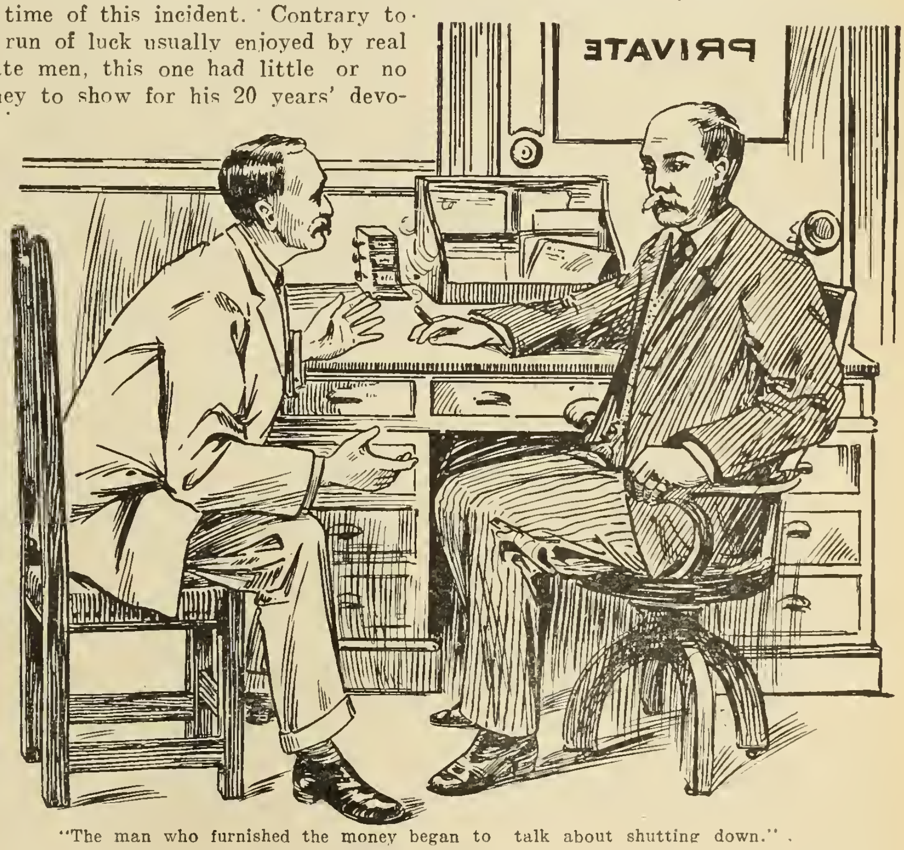
The young doctor's health failed him and his father left his chair as Dean to protect their interests by giving his personal attention to the management of the shop. The Dean was more eccentric than his son, and in a month the plant was shut down and I have not learned of its successful operation since.

What the Real Estate Man Accomplished

The Dean and his son have some points in common with another misfit. This man is one who for 20 years of his life has been a real estate broker, traveling from one part of the country to another, buying tracts of land, laying out town lots and selling these at auction. He had absolutely no experience in or about a shop of any kind till the time of this incident. Contrary to the run of luck usually enjoyed by real estate men, this one had little or no money to show for his 20 years' devotion to real estate. It is insisted that the man who joined him in this industrial enterprise furnished the money. This "misfit" came to the new shop and assumed oversight and direction. He had repeated differences with his men because he desired to carry out ideas which were not mechanical, unbusiness like and inconsiderate of his men. In four months he fired his superintendent and hired another; and in three months more this one had left. Following this it appears that the shop was in a fair way to shut down; contracts on hand were not profitable; no work or product of the shop had been remunerative; the man who furnished the money began to talk about shutting down, and the representatives who had arranged for the location of the enterprise in their city began to talk about an investigation.

A common failure in these three cases was that the executive refused to entertain the suggestions of those who were experienced in the work in question, they were all inflated somewhat with conceit, and all believed, apparently, that anybody can do anything he undertakes.

The experience and special training which a man secures in his line, and a proper appreciation of the same, is entirely lacking in the men in the last two examples. These, with other things, some of which are already obvious to the reader, contribute to the failure rather than success of the executive who thinks he lowers his dignity by admitting that he doesn't know it all. The writer believes that the points mentioned in the early part of this article will, if thoughtfully observed and put to use, help the executive to avoid any part of the dismal failures later recorded.



"The man who furnished the money began to talk about shutting down."

Messrs. C. M. Rudel and M. P. Shea, of power department, Canadian Fairbanks Co., Montreal, succeeded in carrying off the prizes in the fifteen mile and three cylinder motor boat events at both Lachine and Chateauguay regattas. Their boats are equipped with Fairbanks-Morse engines.

Effect of Treatment of Steel in Boiler and Machine Shops *

More Detail Consideration of Effect of Punching and Shearing than Ordinarily Considered — Effect of Action of Cutting Tools

By WALTER ROSENHAIN

The utilization of steel for purposes of engineering construction necessarily involves a whole series of mechanical operations, and while it is obviously essential that it should be capable of being worked into structures or machines without injury, it is equally desirable that the workshop manipulations should be so regulated as to inflict a minimum of injury upon the material. In practice, however, the majority of workshop operations are regulated rather by questions of economy and manufacturing efficiency than by any careful consideration of the peculiarities and requirements of the various materials employed. Broadly speaking, there is much justification for this course, since steel is known to be a ductile metal capable of undergoing very severe deformation without breaking; it therefore does not seem unreasonable to argue that it should be capable of undergoing the much milder treatment of the workshop without injury. Unfortunately, experience has shown—sometimes in a striking and tragic manner—that this is not always a sound argument. In these cases there is a very natural tendency for the engineers concerned to lay the blame at the door of the steel itself and to ascribe the failure, be it under test or in practice, to some mysterious fault in the metal itself. While the possibility of faulty material cannot, unfortunately, be entirely precluded, there is none the less grave reason to believe that a careful inquiry into the workshop treatment to which the material had been subjected would often reveal the true causes of failure.

Effect of Punching.

The injurious effects of certain otherwise convenient and economical workshop methods have, of course been fully recognized by engineers. Thus the punching of rivet holes in boiler plates has been abandoned because of the injury which the punching produces in the metal adjacent to the hole. In the same way, for some purposes, it is required that the edges of plates which have been cut by shearing shall be planed off. Well known as the injurious local effects of these processes may be, it is worth while to look at the matter a little more closely. In the case of punched holes, for example, it has been found that the injury does not extend to a depth of more than two or three millimetres into the metal around the holes, and it might perhaps be supposed that a plate of steel in this condition could be no weaker than it would be if the zone of injured metal were removed and correspondingly larger holes left in the plate. But this is not the case. The process of punching involves an extremely severe local deformation of the metal at and near the surface upon which shearing finally occurs; the adjacent material has thus undergone an amount of deformation only just short of that required to produce fracture. The metal in this zone, therefore, is extremely liable to crack, and in favorable circumstances—especially if the material is subjected to either vibration or alternating stresses of any kind—such a crack is liable to extend rapidly through perfectly sound steel. This material, while capable of exhibiting great ductility under suitably applied stresses, always possesses a definite crystaline structure, and this involves the existence of cleavage planes along which fissures may be propagated when the conditions of stress are favorable to that mode of fracture rather than to ductile behavior. This tendency for a crack once formed in a place of local injury to travel through the adjacent normal metal, while it undoubtedly exists in even the best steel, is aided in most commercial material by the fact that the structure of the metal is neither so fine in grain nor so homogeneous as could be desired. Larger crystals involve better developed cleavage and a less tortuous run for a fissure once started, while the existence of regions in which carbon and other elements are unevenly distributed also constitutes an aid to the propagation of cracks. Yet these more or less favoring conditions are to be met with at the present time in the great majority of plates and bars of commercial steel. It would no doubt, be well for the steel maker to avoid them if possible, but meanwhile the workshop engineer must reckon with the material as it exists, and must in his turn avoid operations which result in local injury to the metal.

Dangers of Caulking.

The considerations referred to above lead to the conclusion that it is severe local deformation of the metal which is to be feared rather than larger but widely-distributed distortion. In practice, however, less attention appears as a rule to be given to localized deformations than to larger changes of shape—the latter being, in fact, usually carried out at a red heat. This, of course, renders properly effected changes of shape quite harmless; the kind of injury referred to here is only produced in the cold. Punching and shearing have been taken as typical of processes that produce severe local injury. Caulking is another example of this kind, but since it is ordinarily applied to the edges of plates where the material is not subjected to serious stresses, it is very rare for harm to follow from this operation; an exception must be made, however, for cases where the caulking has been carried out in such a manner as to seriously groove or indent the underlying plate; fractures resulting from such caulking have been known, and in view of the importance which we are now led to attach to severe local deformation this is not surprising. There is, further, a whole class of operations of a kind not contemplated by the designers of structures or machines, but none the less frequently carried out—sometimes to counteract a want of fit due to bad workmanship, sometimes for mere reasons of workshop convenience, to save either time or trouble. These involve severe local deformation of metal; pieces of metal are hammered, pressed, and otherwise manipulated in order to fit where and as required, and in most cases the fitter or foreman doing the work is quite unaware that he may be doing serious injury to a material which he looks upon as ductile and amenable to almost unlimited change of shape. The remedy for evils of this kind lies in the hands of the practical engineers who control workshops, once they have been brought to recognize the importance of this aspect of workshop practice, the remedy will soon be forthcoming, but meanwhile there is unfortunately always the easy course of blaming the steel.

Action of a Cutting Tool.

Apart from these more or less "irregular" workshop manipulations, there

*Abstract of article appearing in Engineering Supplement of London Times.

is a whole class of most important and necessary operations which also involve the severe local deformation of metal—viz., the action of all cutting tools. whether driven by hand or by machine. Essentially, the cutting action of a tool is chiefly a process of extremely local application of compression and shearing stresses, resulting in the local crushing and shearing of the material. The difference as between a punch and a drill, for instance lies chiefly in the fact that while the former removes the entire material in a single operation, involving the use of large forces at relatively low speeds, the latter punches and chips the material away piece-meal, the stresses and deformations involved being proportionately smaller. Not only so, but owing to the fact that the portions of metal removed by a cutting tool are generally thin in section and easily deformed, it is these rather than the remaining solid portions which undergo the more severe deformation. We see the result in the extreme fragility and brittleness of the cuttings that come from machine tools.

Effect of Cutting With High Speed Steel.

But even beneath the cut of a planing tool, for example, there is left a perceptible skin of deformed and injured material. If the cut has been light and the speed low, the depth of this skin is very slight, and it may become quite imperceptible if a fine finishing cut has been taken from the surface. On the other hand, the use of high speed tool steel and the increased speed and power of the machine tools that have been introduced to utilize the greater cutting power of these tools undoubtedly result in the production of much deeper layers of injured metal on the surfaces of machined articles. Where a finishing cut is taken deep enough to remove this injured layer no harm will result—the position will be similar to a plate in which punched holes have been enlarged by drilling out the hardened metal around them. Examination of objects machined in this way has, however, revealed the fact that in many instances the hardened surface layer caused by the violent action of high speed tools has not been removed. It is not, of course, easy to trace failures of this cause, but the knowledge of the effects of surface injuries to steel should lead to caution in this respect. This applies more especially to the case of holes that have been drilled at high speeds. In this case the injured surface layer is not removed at all, and it should be borne in mind that the faster the cutting action of a drill the more nearly it approximates, in its effect upon the adjacent metal, to the deformation of a punch. With the speed at present attained in machine tools it is probable that there is still a considerable margin in favor of holes drilled at high speeds as compared with punched holes, but it is at least worthy of careful inquiry whether the margin is adequate. In an entirely different field, the construction of high-speed internal combustion engines for motor cars and other purposes where reduction of weight is important the question also arises how far the metal injured by high-speed machining has been removed in the finished part; in this case, where rapid alternating stresses and much shock and vibration have to be guarded against, it would seem that the entire removal of the injured layer should be insisted upon. Perhaps the finishing of the surfaces wherever possible by grinding processes as distinct from cutting operations would be the most desirable course. In any case it is quite easy, by the microscopic examination of small sections of a few trial pieces, to determine the exact depth of the injured layer and also to decide whether a given form of finishing cut or final grinding has entirely removed the deformed material. It should perhaps be mentioned here that a process of annealing, such as heating the article up to a bright red heat and allowing it to cool in air would be sufficient to remove the injurious effects of most forms of workshop manipulation, but in many cases work that is nearly or quite finished cannot be thus treated, while in other cases special properties of the material might be adversely affected.

It is not in any sense the object of the present writer to criticize adversely either existing workshop practice nor the general desire to render it as economical and efficient as possible, and least of all to disparage the great advances due to the advent of high-speed tools. On the other hand, as our knowledge of the properties of steel advances it becomes necessary to review existing methods and processes with a view to eliminating any that may involve hitherto unsuspected sources of danger. At the present time engineers are still too ready to lay the blame for any and every failure upon the material; it is quite true that there are still many things to be discovered as to the mechanical properties of steel, but in every case it is necessary to look for known causes rather than to fly to unknown and mysterious ones. When the methods of engineers are above reproach they will be in a better position to put the blame for failures upon the steel-maker.

It's easy to drift. Success comes by pulling against the current.

DIAMOND TOOLS, AND HOW THEY ARE MADE.

By Charles C. Maison, C.E.

There are some materials, because of their hardness, structure or non-conductivity of heat, cannot be worked economically by means of steel tools. The latter become worn rapidly, losing their shape and size to such a degree that the work done by them is inaccurate, which causes constant interruption of operation, loss of time and money and the necessary replacing by new tools or regrinding or shaping of the old ones. The great amount of friction developed in cutting certain materials draws the temper of steel tools making them useless. For instance, hard rubber, paper, hardened steel and hard stone cannot be readily worked with steel tools. In these cases a harder material is required, and for this reason the diamond is used.

There are two kinds of diamonds used for this purpose which are totally different in appearance and quality. The first variety has a very dark purple brown color on the surface, but a purplish grey fracture, is an amorphus grandular mineral with very little or any crystallization visible or traceable, and is called carbon, or "black diamond." It is the hardest material known, and has great strength. The other variety, called Bort, is entirely crystalline, is generally transparent and may be of all colors of the rainbow, as well as clear and transparent as glass. The clear Bort is harder than all other Bort, except some varieties which are almost black. Bort is, however, extremely brittle, and is readily fractured or "Cleaved" in the three directions of its cleavage planes parallel to the sides of the octahedral crystal, in which shape it is most commonly found. The Dodecahedral crystals are also readily cleaved in similar manner.

All kinds of grinding wheels being made of extremely hard materials, are most readily kept free from filling or glazing and in perfect shape by diamond tools. The compressed carbon is most advantageously worked by diamonds. In certain classes of work, where great accuracy and precision are primary requirements, or where extremely fine lines are essential, the diamond is the only material that answers the purpose. Thus lithographers, engravers and scale-makers use diamond tools for fine work. Hardened steel spindles are accurately turned by diamond tools.

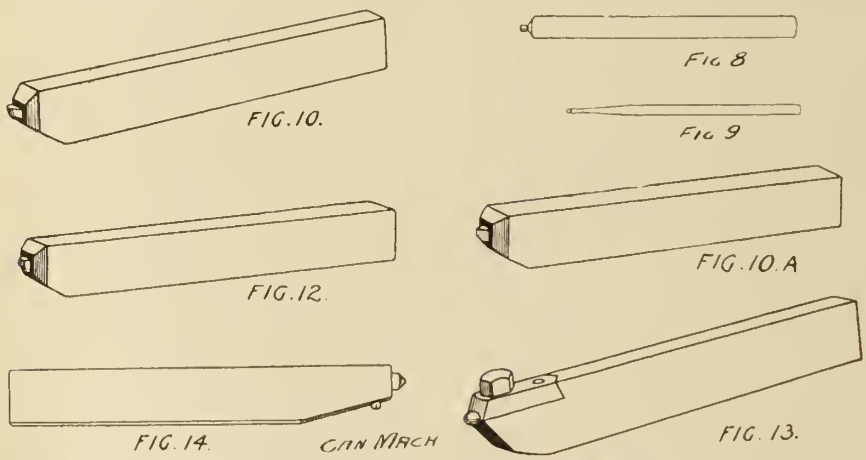
Diamond Dies for Wire Drawing.

A very important field of manufacture in which the diamond is all but imperative to obtain satisfactory results at reasonable cost, is that of wire drawing.

Formerly small wires were drawn through holes in hardened steel plates, and while this method is still in use, accuracy of wire diameter is so essential, especially for electrical work, that diamond is now used. By using diamond dies the delays in replacing worn dies, and other apparatus, is obviated, and because of the permanency of accuracy of the calibers of the holes in the diamonds, the cost of manufacture and labor is materially reduced.

Diamonds are used in core drills which, in an extreme case, have cut solid cores of about 19 inches in diameter. Stones are drilled and sawed by the use of diamonds. In diamond drills stone saws and grinding wheel dressers, the rough diamond is used in appropriate holders, set by striking, brazing, soldering or by casting molten steel around the diamonds.

Diamonds can be plated like any metal. This property is made use of in the "galvano-plastic" setting. The setting consists in plating the diamond and then casting molten metal around it which alloys with the deposited metal. In this way an absolutely firm and rigid setting is obtained. In Figs. 8 and 9 are shown diamond drills which are set in steel, probably set under the conditions referred to.



Diamond Tools and How They are Made.

Diamond Lathe Tools.

The use of diamonds as the cutting points of lathe tools in the machine shops have already been referred to. The diamonds in these tools are all shaped by cutting and polishing or rubbing down, as will be described, to imitate the customary shapes of tools. They are sometimes set by the galvano-plastic method, in which case the resulting bronze nib containing the diamond is brazed into a steel holder. The modern principles are simpler, and a more secure setting is produced.

In Figs. 10 to 14 are shown some forms of diamond lathe tools. Fig. 10, A, is a V point; Fig. 10 shows a round nose tool; Fig. 12 a square nose tool; Fig. 13, a rough stone tool used for turning paper calendar rolls; and Fig. 14 a tool with removable round steel bit in which the diamond is set. The rough stone tool in Fig. 13 is made simply by clamping a rough piece of black diamond in proper position between two pieces of steel adapted to be held in tool post. Calendar rolls must be very accurate and smooth, which is secured in best degree by a shaped cut diamond tool of this character. Diamond tools are economically advantageous, moreover, because very high speeds can be used, 450 to 550 ft. per minute being ordinary. The greatest care should be given diamond tools and when so handled they prove remarkably economical, as their life is very long and the expense of constant sharpening is done away with.

Preparing of Diamonds for Tools.

The processes by which the diamond is prepared for use is but little known; therefore, they shall be briefly described. In order to bring about a round or cylindrical shape, common to diamonds, whether for round nose tools or sharp points, the diamond is set in a very strong cement on an adjustable face plate of a small lathe, running at approximately 300 r.p.m. Then a suitable stick or handle at the end of which a diamond is secured by the same strong cement is used like a hand tool so that one tool bears against the other. Both will then wear off and any desired round shape may be produced. Polishing is done by placing the diamond, properly weighted, upon a flat disk of cast iron running at from 2,000 to 3,000 r.p.m. This cast iron disk is covered with a mixture of very finely powdered diamond dust and olive oil, and in course of time the diamond rubbed down thereon obtains a most highly polished surface. In this manner the intersections of the different polished planes produce very sharp cutting edges which can be made of any angle required.

Black diamonds cannot be polished, therefore they are rubbed down using the principles already given.

A diamond is prepared for drilling by cutting a conical depression on either of its sides, in line with the hole, leaving only a thin central portion to be drilled. This operation gives the form of holes used for wire drawing with a small margin for finishing. After the stone is pierced or drilled, which is in a rough state, it is mounted on a polishing machine running from 3,000 to 6,000 r.p.m.; while a tempered steel needle truly concentric with the hole is made to move mechanically backward and forward in it rapidly; added to this is powdered diamond dust and oil.

TRANSPORTATION AND CIVILIZATION.

(By Hiram Maxim.)

Civilization can grow no larger than the boundaries of transportation and communication will permit. Cities overgrow themselves because adequate transportation is lacking. The old time farm, the mountain height, the forest deep, the lonely lake, will sooo burst from isolation, for the flying machine will people them with a teeming population. High speed and convenience of travel annihilate distance. The remote becomes nearer, the stranger a neighbor, and widely separated communities a united neighborhood.

Among the possibilities of the future will be the wireless electric sky roads, or zones of electric energy, leading from centre to centre of population and industry, along which flying machines will pass to and fro, drawing their energy from an electric system stretching along the earth, thus obviating the necessity of each individual flying machine developing its own energy. Flying machines will carry electric meters, and the consumer will pay for the energy used just as he now pays for the electric current which lights his residence.

When the flying machine shall have come into general use many strange structures will be contrived for the reception and storage of them, or, we may say, flying machine garages, where daily pilgrims from country to city and return will house their aerial equipment, and from which they will take flight for home when their day's work is done.

As land values always accord with supply and demand, the flying machine will bring vastly increased areas of suburban land into the market and values will be enormously enhanced. Many a poor farmer will be made glad from the sale of his unyielding acres to the city man dropping in upon him from the sky.

An Improvised Thread Milling Machine for Special Job

How a Special Jig was Utilized to do Thread Milling on a Universal Milling Machine — Description of Jig and Cutters Used.

By JOHN EDGAR

Some one has used the term "universal machine tool" in speaking of the universal milling machine. That this term more fully describes the machine is understood when we think of the operations that it is possible to perform on that useful machine tool. We can do lathe, planer, shaper, drill press and boring machine work, besides many operations that cannot be done on these machine tools. Whenever we get stuck on a job it has become most natural for us to immediately bring the universal milling machine up before our mind's eye and look there for some possible way out of the difficulty. And it is surprising how tight a corner has to be in order that there is not some possible way out of it on the miller.

Usefulness of Attachments.

Most shops have a universal milling machine, and it along with a small lathe generally constitute the tool room equipment. Of course, in order to get the most value out of the miller we must resort to several attachments as accessories to the regular machine in doing a great amount of irregular work. The vertical milling attachment is one of the attachments that has proved of most value as an accessory. When the spindle of this attachment is made so that it can be given any position, either vertical, horizontal or the intermediate points, the value of the attachment is greatly enhanced. This attachment is generally termed a "Universal spindle attachment." The swing of the spindle is in some designs restricted in a plane at right angles with the spindle of the machine. This brings the spindle of the attachment at right angles with that of the machine when it is in the horizontal position. An attachment of this type is necessary in milling spirals or helically grooved work when the pitch is such that it would be necessary to swing the table of the machine around to an angle of more than 45 or 50 degrees, as the maximum swing of the table ranges between these figures.

Special Attachment Necessary to Cut Screw Threads.

When the angle of the helix is increased, as in the case of ordinary screw threads, the gearing used on the miller to give the proper lead is such that it is next to impossible to rotate the work held on the head and tail centres of the spiral head. Even on such pitches that can be milled in the regular way where the lead causes a combination of gearing that has a high ratio from lead screw to worm shaft the tortion in the screw is liable to cause a jerky motion of the work. This unevenness is noticed in cutting work in which the angle of helix is as high as 60 degrees, and for such angles as between 75 and 90 degrees special arrangements such as to be described here must be used.

Let us, before we go any further, figure out a combination of gears to cut a screw with four threads per inch. The lead is $\frac{1}{4}$ or .25 inch. The standard milling machine is made with a 4 thread per inch screw and 40 teeth in the worm gear in the head, giving a ratio of 10 to 1; that is with even gearing connecting the lead screw and spiral head worm shaft the work will rotate one-tenth of a revolution for every revolution of the screw, cutting a 10-inch spiral. Consequently the lead of the machine is said to be 10 inches. Then in order to cut a spiral with a lead of $\frac{1}{4}$ inch the ratio of gearing would be 10 to 1. That is, the spindle of the spiral head would make one turn for every turn of the lead screw that moves the table. Such a ratio is prohibitory where smooth work is required. The gears would be in our example:

Gear on worm, 24 teeth.
First gear on stud, 60 teeth.
Second gear on stud, 24 teeth.
Gear on screw, 96 teeth.

One shop where a good deal was thought of milling as a machining process, had a lot of threaded work to do, consisting of short lead or traverse screws, mostly all 4 threads per inch,

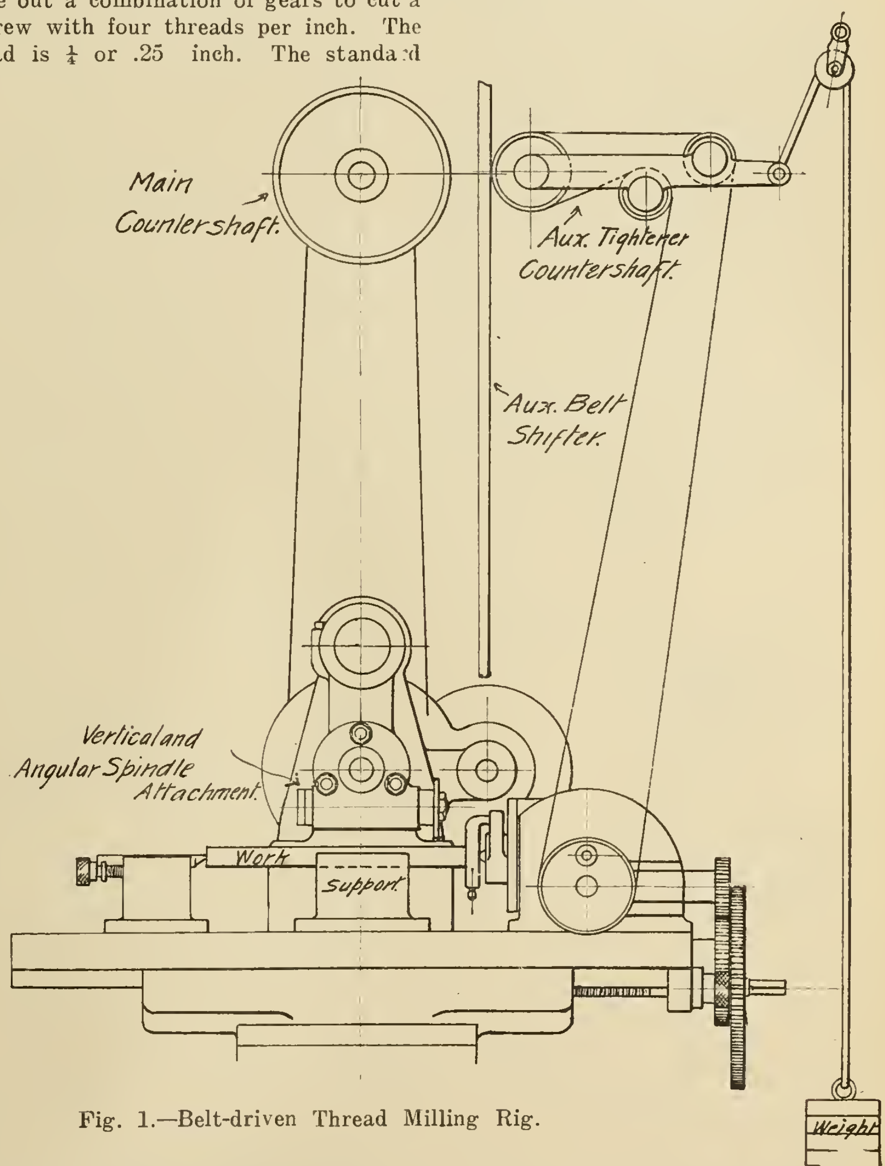


Fig. 1.—Belt-driven Thread Milling Rig.

acme standard thread, and a number of different sizes of worms that were manufactured in large quantities. These they desired to mill, and this being before the thread milling machine had been placed on the market, attempted to do them on the miller as ordinarily set up. But the jerky motion given to the table and work made it impossible to obtain good results. Their faith in the milling machine had not been shaken, however, but only set back a trifle. After a little thought on the matter the rig shown in Fig. 1 was set up, and the work was handled with results well up to their expectations.

Description of Special Jig.

The main feature in this arrangement is that of the manner in which the feed to the table and the necessary rotation of the work is obtained. The feeding process was reversed and instead of the screw driving the gears, the screw was made the driven member. This was accomplished by replacing the index crank by a small pulley, shown in section in Fig. 2. By this means the gear ratio was reversed in relation to the driving member and a smooth motion was obtained. The index pin served as a driver and allowed the work to be indexed for multiple threaded screws.

The feed mechanism through the knee and saddle was, of course, disengaged. The longitudinal motion of the head made it necessary to have a tighter arrangement of the counter shaft to keep the belt at proper tension.

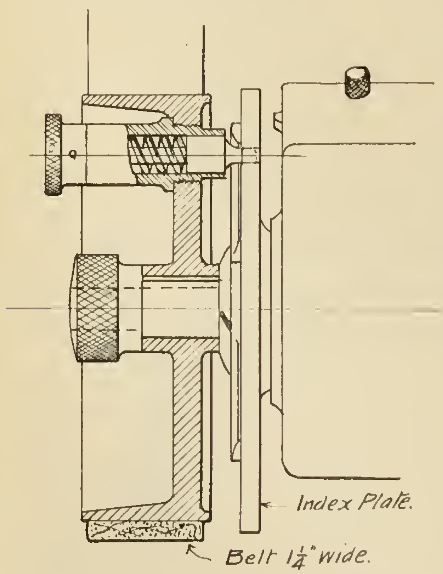


Fig. 2.—Special Index Head Pulley.

This arrangement, while it proved a success and made such a good showing, was eventually replaced by the more compact arrangement shown in Fig. 3. This, as will be seen, is a self-contained mechanism and requires no overhead belts, and is of a more permanent design. In this case the worm shaft of the head was made longer so that the universal joint could be connected on the rear end. The new cone feed bracket had to be made and secured in position and the cone shaft connected to the worm shaft by means of the joints and telescoping shaft. This arrangement made it possible to use the index pin as in ordinary spiral work.

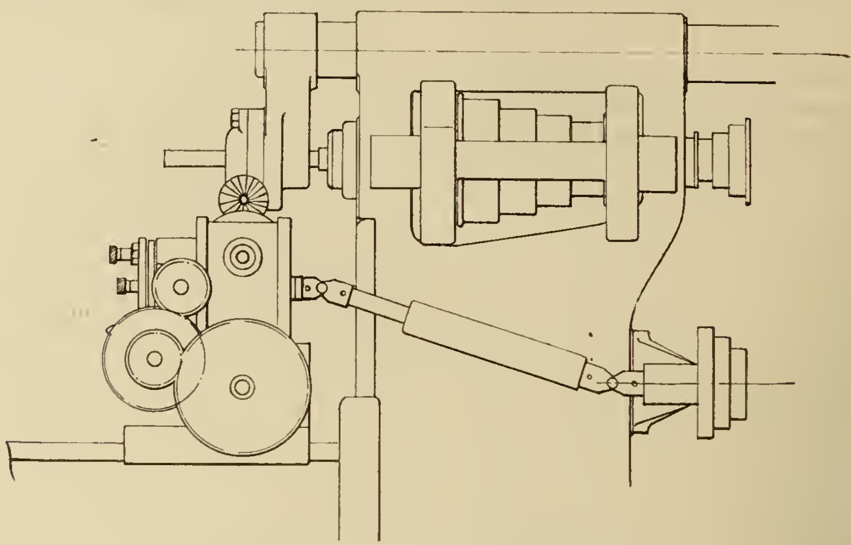


Fig. 3.—Shaft-driven Thread Milling Rig.

Neither of these arrangements provide an automatic stop and the work has to be watched pretty closely. As this was really a makeshift arrangement such fine points were never missed as there was always an operator near at hand. Lots of good work has been done with these rigs and probably the idea can be used by some one for the purpose mentioned, or for some other difficult proposition.

Some of the Details.

The method of supporting the work under the cutter is shown in Fig. 1 and a sketch of the fixture is also shown in Fig. 4, which is an end view. A different support has to be provided for each diameter of screw or worm. The top of the support is furnished with the hardened steel plates which remove the burr so that the supporting bearing, which is of cast iron, will not be badly worn.

The cutters used are mostly all cut like Fig. 5, with staggered teeth on the side. This was necessary in order to get good chip room and not weaken the cutter. When the pitch was coarse enough to allow it the regular spacing of the teeth was found to act better.

A staggered tooth cutter is difficult to gauge, and to overcome this the Pratt & Whitney Co. have one tooth on both sides coincide so that a template may be used and so that the width of the cutter may be measured with micrometer calipers. This is a patented feature and of course cannot be generally used without permission.

Cutters with formed teeth that can be sharpened without changing their shape have been used to considerable extent and have shown up good in comparison with the milled tooth affair.

It need not be mentioned that it is impossible to mill a square thread by the milling process, on account of the twist of the thread. Even the 29-degree acme thread is not accurately shaped by the milling cutter unless it be given a peculiar shape, which would be hard to obtain. The inaccuracy is, however, in this thread very slight and may be passed as unimportant.

When the angle of the thread is great the thickness and possibly the angle of the cutter would necessarily need altering in order that good shape threads result. This is because the figures given for the shape of the thread section are on a line parallel with the axis of the screw or worm and the shape left by

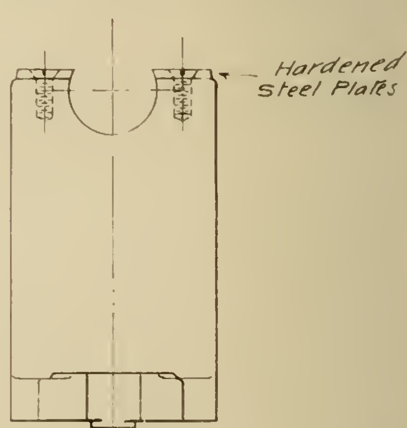


Fig. 4.—Stock Support for Slim Work.

the cutter is that on a section taken normal to the thread helix since the cutter is set tangent with the helix.

The worms are milled with two cuts, a roughing cut and a finishing cut. The surface left is very smooth and is good as compared with that produced when

the work is done in a lathe. The time is, of course, reduced and the job is not one in which it is necessary to hang over the work as is the case on the lathe, and the grade of help used is lower.

The cutting lubricant used is soda-water and lard oil mixed, which is a very good cutting compound.

Since the rigging up of this machine the concern has installed a regular thread milling machine which takes care of all the screws, while the miller is still used to mill the worms.

The results obtained on the thread miller are remarkable in both accuracy and speed. They leave little argument in favor of the lathe for this class of work.

Some have the impression that the action of the cutter would be such that the stock would be peened rather than cut, causing a distortion, but results fail to show any such peculiarity. Even

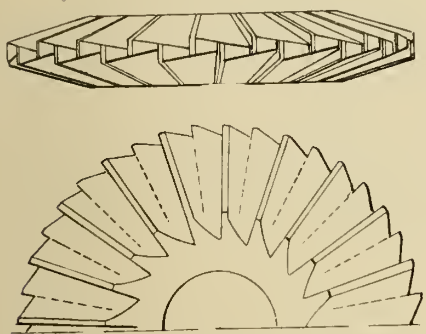


Fig. 5.—Staggered Teeth on Milling Cutters.

when but one cut is taken the results do not seem to suffer, and the thread is always left in good condition when milled with a properly-sharpened cutter.

Dull cutters will have the same effect in this kind of milling as in any other and are to be avoided. They are not economical. The avoidance of sharpening at short intervals means poor results and shorter-lived cutters. No tool will grind away so soon as a milling cutter if used after it has become dull, and in very little time may be placed beyond repair.

This particular case may lead the reader to hit upon a way out of some difficulty he may have; if so it will accomplish the object intended by the contributor.

ELECTRIC SMELTING.

The summary report of the mines branch of the Canadian Department of Mines for the fiscal year 1907-08, just issued, comprises, in addition to much statistical information, which has previously appeared in a preliminary report, the results of investigations into the mineral resources and metallurgical industries of the country. An examination into the iron ore deposits of Vancouver and Texada Islands on the Pacific Coast was made by Einar Lindeman with the view of obtaining data looking to the establishment of the iron industry in British Columbia He reports that as regards ore supply the deposits on Texada Island and at Head Bay, Klaanch River and Quinsam River, Vancouver Island, are of sufficient magnitude to furnish ore to a blast furnace for a number of years. A number of analyses showing the quality of the ore are given. The magnetites are high in iron and few, if any, have a phosphorus content exceeding 0.05 per cent., and in most cases considerably below this figure, but, on the other hand, they are, as a rule, high in sulphur, though not to such an extent as to render them unfit for smelting. The coal output of the Vancouver Island mines last year is estimated at 1,350,000 tons and the production of coke was about 17,000 tons. This coke contains 15 to 16 per cent. of ash, which, by a more careful separation of the shale, could be reduced to about 12 per cent. Limestone deposits in close proximity to the iron ore, which are of great extent and unusual purity, would furnish an inexhaustible supply of excellent fluxing material. The raw materials being adjacent to the coast are favorably situated for transportation and shipments could be made all the year round to a furnace established anywhere on the coast line. The principal offset to these highly favorable conditions is the fact that labor cost is greater in British Columbia than elsewhere in Canada. Moreover, the market in that Province for manufactured iron will be a limited one for some time. and as the American duty of $4 per ton on pig iron will operate against its exportation to the United States, it might be necessary to find a market elsewhere for the surplus output.

An investigation of the iron ore deposits on the Nipisiguit River, 15 miles from Bathurst, N. B., revealed their value and also demonstrated the utility of magnetometric surveys, which showed that the commercial value of the property lay in another direction than the deposit previously known. The result was the acquisition of the property by a syndicate which will shortly begin operations. Iron ore traces near Penetanguishene, Ont., were investigated by B. F. Haanel, who reported that there was no deposit of commercial importance.

Electric Smelting.

The question of electric smelting receives some attention in the report with a view to the solution of the problem of the direct production of steel from the ore, in connection with which technical difficulties have been encountered It is thought that these may be overcome by the application of the Lash steel process in an electric furnace and Canadian Lash Steel Process Co., of Niagara Falls, furnishes a description of its working. Successful experiments with this process in the case of the open-hearth furnace on a commercial scale indicates its possibilities with regard to electric smelting. In this process, finely divided ore is mixed with carbon, a certain quantity of finely divided carboniferous iron, such as cast iron borings, or granulated pig iron, sawdust and fluxes suitable for the iron ore under treatment. The working of the process can best be explained by comparison with the open-hearth "ore process" which consists in forming a bath of molten pig iron and then adding thereto a sufficient amount of ore (iron oxide) to reduce the carbon content of the metal to the desired amount. The oxygen of the ore, combining with a certain amount of the carbon in the pig iron, forms carbon monoxide gas and sets free the iron of the ore to mix with the bath of molten metal. Thus a mixture of approximately 75 per cent. pig iron and 25 per cent. ore can be worked up. But in the Lash process the proportions are very different, for a large proportion of ore can be used with a small percentage of carboniferous iron. A typical mixture has the following percentage composition:

	P.C
Iron ore	54
Cast iron borings or granulated pig iron	27
Sawdust	4
Limestone	4
Coal tar	3
Coke	8
	100

These constituents are finely divided and intimately mixed, and when heated to a high temperature the reactions that occur are similar to those found in the open-hearth furnace using the ore process. The cast iron borings correspond to the molten bath of pig iron and re-act with the ore but the latter being in large excess, it is necessary to supply a certain amount of free carbon in the form of coke for the complete reduction of the ore. The great economy of the process lies in the substitution of a large amount of ore for pig or scrap iron. In using the Lash mixture in the open-hearth furnace, it is necessary to have a bath of molten metal, as otherwise it would not be practicable to heat it to the reacting temperature without losing carbon in the mixture by combustion. If, however, the charge is

put into an electric furnace, no difficulty of the kind is experienced, since the gas in an electric furnace is neutral, in contra-distinction to the oxidizing atmosphere of an open-hearth furnace. Experiments using the Lash mixture have been made in the electric furnace on a small scale with successful results. It was found that the yield of metal amounted to 98 per cent. of the metallic contents of the mixture. The average cost of the materials in Canada for the production of 100 tons of steel ingots in the regular open-hearth furnace is $20.79 per ton, and it is claimed that by using the Lash mixture in the electric furnace, this can be reduced to $16.22 per ton, and that the technical difficulties which have been encountered in the production of steel directly from the ore by electricity will disappear. Different electric furnaces are being tested to ascertain the type most suitable for the application of the process.

LINING LOCOMOTIVE GUIDE BARS FOR LATERAL WEAR.

By M. H. W., Port Huron.

While visiting several railway repair shops during the past summer, I was particularly struck with the various ways in which the same job was performed. For instance, the manner of fastening liners to steel guide bars, for taking up lateral wear, was accomplished in some places by drilling clear through the guides, and then riveting the liners in place. This takes considerable time, and when a bar requires a liner on each side, some difficulty is met with in getting them both tight when using the one rivet for both sides. Others drill and tap holes about one inch deep, then fasten the liner in place by screwing into these holes a length of threaded iron, which is cut off to proper length and then riveted. This does not always make a tight job, and frequently a tap is broken in a hole. Then again, others used countersink screws for holding the liners in place, or, instead of using liners, babbitted the sides of the guides. Of course, in all previously mentioned methods the bars had first been planed certain depths to make room for the liner. I was informed that the babbitted liners wore much longer than the original bar did, and were quickly put on and machined. If this is correct, I am inclined to think this method is better than the others mentioned.

After considerable experimenting I find the following method to be very satisfactory: Take a bar which has been planed for liners on both sides, the planed surface being 7-32 inches deep and 2 inches wide. Steel liners, ¼x2 inches, are drilled to the jig shown, then clamped to the guide bars and the bars drilled with a ⅜-inch twist drill to a depth of ¾ inch. A short twist drill that has been ground so that it is much smaller ⅛ inch back from the point than at the point, and also ground off the centre, is inserted in the hole already drilled, and the hole drilled about ¼ inch deeper. A drill ground in this way will produce a hole similar to the one shown in Fig. 1. After countersinking the liners with a long taper countersink, a 5-16-inch steel ball is dropped in the hole, either a brass or soft iron rivet is driven in. While riveting up the top end, the ball is forcing itself up into the slot which has been sawed in the end of the rivet, causing the rivet to spread and fill the enlarged part of the hole. These liners, if of common rolled bar stock, should be planed after they are riveted on; if cold rolled stock is used, this is not necessary, and the recess in the bars should be planed to suit the thickness of the liners. This is an inexpensive method, as the steel balls used do not cost over one-half cent apiece, and

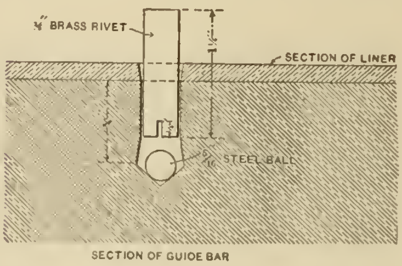


Fig. 1.—Lining Locomotive Guide Bars For Lateral Wear.

there is no tapping of holes or turning and threading bolts or rivets. One end of the liner should be made to butt up against the end of the planed recess in the bar, thereby preventing any shearing strain being put on the rivets. While these liners are not so tight that they cannot be taken off by driving a flat chisel between them and the bar still, properly fitted endwise, they have held for two years to my knowledge, or until they have had to be removed through wear—Machinery.

BOUND FOR THE TOP.

In the nature of every civilized man there is an instinct of progressiveness—a desire to excel in some particular. It is found in some degree, in the most inefficient as well as the most energetic of men. If the opportunity for its outlet does not occur in his work it will display itself in his recreation—even in his dissipation. It appears in the ditch digger and in the accountant, in the mill operative and in the skilled mechanic. It may exhibit itself in the breeding of a few hens, the improvement of a bull-terrier's progeny, or in the raising of the earliest peas or the biggest squash in a suburban lot. It may turn to the building of a motor-boat or sail-boat; to experimental recreations in mechanical, electrical or chemical affairs; to studies in literature or art

Corliss, the inventor of the noted cut-off valve system for steam engines, made his experiments after working twelve hours a day as a meat-cutter. Nathaniel Hawthorne attained his splendid height in literature while working in the Custom House.

Turner, one of the greatest of English painters, gained some measure of renown while earning his living as a barber.

William Herschel, afterward knighted for his attainments as an astronomer, built his famous instruments and astounded the scientists of the day by his discoveries while earning his living as a violinist at concerts and dances.

The whole point is that, while the chance of promotion for the mechanic, the clerk, the employe of any sort, may occur at any moment and should find him ready, other chances may and frequently do occur outside of any actual advancement in his particular occupation. But it is absolutely certain that unless he is ready for them they will, in either case, mean nothing to him, nor will he often see them. If he has not a few dollars ahead the better job a hundred miles away, or the good bargain in a little real estate, or the chance to develop some bright little business idea, appeals in vain. If he has not acquired sound confidence in himself and some assertiveness of his own knowledge he will not be called upon to take charge when his chief or foreman is away sick or on vacation. If he permits his recreations to absorb his energies in matters which return him nothing—either in useful knowledge or good hard dollars—he may easily reach middle age with a reputation as a "rattling good fellow," but without the power to raise a hundred dollars for the most urgent necessity or the most promising of chances.

This getting ready and keeping ready gives a man strength, self-confidence and a cheery outlook. It easily lifts him out of the waiting class, because he feels that he is not bound to his job—that, although favor or preferment is a mighty good thing, if it comes his way, he is not dependent upon any one man or firm for his fighting chance.

When people are persuaded by falsehood there's bound to be a reckoning when they find it out.

A rolling stone may gather no moss, but it is awful handy when you level the front lawn.

MACHINE SHOP METHODS AND DEVICES

Unique Ways of Doing Things in the Machine Shop. Readers' Opinions Concerning Shop Practice. Data for Machinists. Contributions paid for.

SOME BENCH-LATHE SCHEMES.

(By F. J. Le Card.)

Fig. 1 is a special counterbore used for cutting a porcelain material and calling for more sharpening than strength. So after drilling for the lead pin a, I cut out a quarter of the stock,

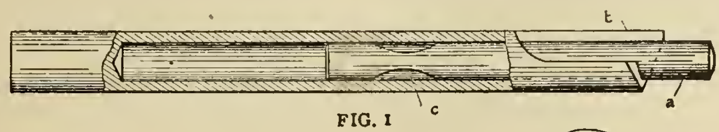


FIG. 1

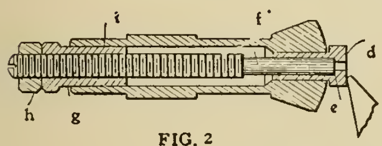


FIG. 2

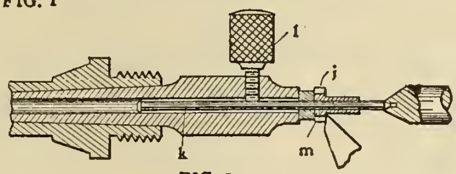


FIG. 3

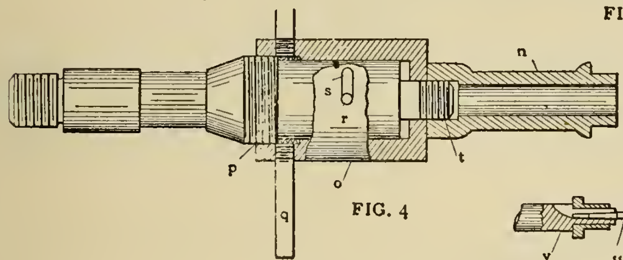


FIG. 4

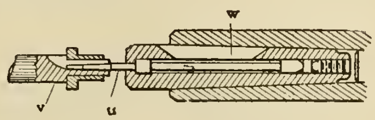


FIG. 5

Bench Lathe Tools.

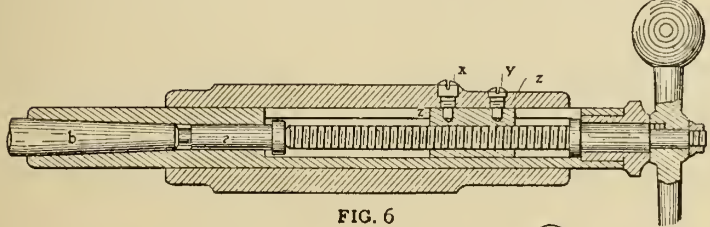


FIG. 6

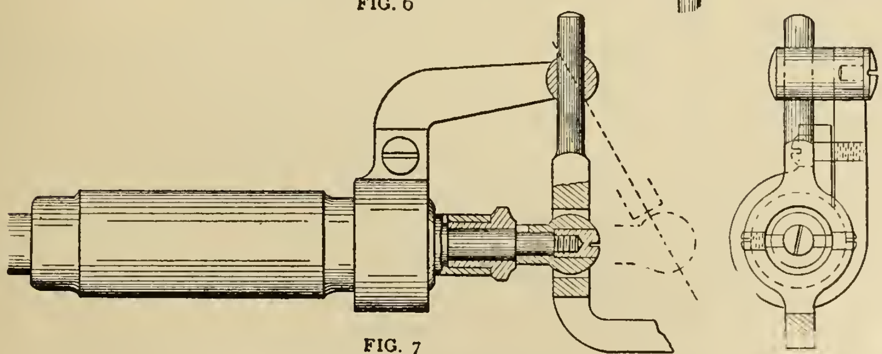


FIG. 7
Bench Lathe Tail.

as shown at b, making it easy to grind the tool.

The pin or tit a is shown cut away at c; when in position it is straight, but before entering the shell it is bent at c and spring tempered. This holds it in place effectively, and the scheme would possibly work well on larger tools.

The chuck, Fig. 2, is one in which a great many pieces like d are faced off to gauge the same distance to e. The gauge screw f is fixed in the plug g by the check nut h, the former being driven tight into the end of the chuck i.

Fig. 3 shows a method of taking a cut on small work which has to be to exact length. The work is driven on to the arbor k (and off also) in a convenient block close at hand; the arbor being flattened for the thumb-screw l, it is very quickly put in place. The position of j on the arbor is of no account, as the work gauges itself at m either with or without a collar.

Fig. 4 is a method of holding pieces like n which have to be faced off to length; the work is finished and nurled and must not be marred or bruised when removed. The shell o has a left-hand thread at p and is provided with handle q and a pin r. The latter moves in the slot s. The work screws on to a right-hand thread at t on the solid chuck.

The shell is in the position shown when the work is in place; the two threads working against each other make it tight. When the shell is turned to bring the pin r to the other end of the slot s, the work n can be readily removed with the fingers. The pin projects from the shell far enough to allow it to be removed if necessary.

An expansion chuck is shown in Fig 5. The expanding pin u runs in a taper holder in the tailstock spindle. It is pressed into the split chuck v which runs in the lathe head, u and v both revolving together; w is a fine saw slit facilitating the oiling of u.

Fig. 6 shows a Sloan & Chace bench-lathe screw-spindle tailstock converted into a push-spindle type by removing the two screws x and y from the nut z. It will be noticed that the centre is thrown out in this tailstock by the push plug a which strikes the nut z and gives the thrust to the center b instead of the latter coming against the end of the screw, which travels here with the spindle.

Fig. 7 is a design for a home-made lever tailstock which explains itself.—American Machinist.

VERY USEFUL AIR HAMMER.

By Fred. Cotton.

Herewith is a photo of a very useful air hammer for making drill shanks for mining camps, which may be had at a very little cost. I was turning them on the lathe and it took up so much time, that I thought out this idea and at once put it into practice.

I took an old drill cylinder that was of no other use on account of the feed nut lug having broken off, also a C.I. block 12-inchx12-inchx14-inch, put the side rods through the block, leaving a shoulder on the rods between the cylin-

der and block, cast steel dies, one-half fastened to block, the other made with drill shank to fasten to chuck. I also removed ratchet and rifle bar, filled the piston with babbit, slotting out the chuck to fit side rods and keep dies in position, also acting as crosshead.

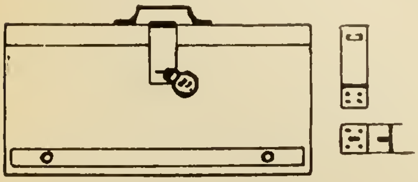
Very Useful Air Hammer.

This hammer is set up on a 12-inchx 14-inch timber, cemented to the ground. It has been working all summer to perfection and makes a good drill shank in less than one minute.

A MACHINIST'S TOOL-BOX.

To most young machinists just out of their time, a trip of a year or so around the country, working in different shops, is very beneficial in more ways than one.

I have seen some start off with tool-boxes large enough to carry a machine shop in; one in particular, who took a 25-pound vice and a large assortment of files, taps, dies, etc., seldom used them, but always had to pay cartage and excess baggage. In my apprenticeship days I made enough calipers, etc., to start up in opposition with Starrett, but now only a very small surface gauge of my own manufacture remains in my box.



A Machinist's Tool Box.

Several places where I worked I carried my tools to the shop in my overalls and left them on the machine or bench; sometimes they were there in the mornings and sometimes they weren't. After one experience, in which a good set of micrometers "weren't," I decided to get a box, and accordingly gave my order for an oak one, 20" long, 10" high and 8" wide, outside measure. The gentleman who made it decided that it was not big enough and proceeded to make it to the same measurements inside. Of course there was trouble when I went for it, and after I had explained that I wanted what I had ordered he grumblingly went at it. There is one handle on the middle of the lid, which makes it neat, and very easy to carry. The lid-joint and hinges are one inch from the top, and inside, the false bottom is two inches from the bottom proper, leaving room for a drawer which pulls forward and is locked when closed by two pins from the inside.

I used a padlock and clasp, which closes over all the screws holding it; thus, it takes something more than a screw-driver to get at the inside. I dare say that many will think the box is too small for a practical set of tools. Well, perhaps so, for those who are accustomed to every convenience for doing the work in hand; I had three sets of calipers, 3", 6" and 12", outside micrometers 2" inside 2" to 12", one solid 6" square, 2' rule, 12" take down square, bevel protractor, three centre punches, two surface gauges, 6" level, thread gauge, 6" dividers, two scribers, small hammer, 10" Billings and Spencer steel wrench, and several other small items, and I was generally able to get a "smock" in before the lid refused to close.

I think this box could be greatly improved upon without materially altering the dimensions, although several inches longer would only give it more of a suit-case appearance. I had it finished natural color varnish, intending, after it got banged around a while to get black varnish finish put on, but other things have turned up which required my attention and the box remains as heretofore.

JIG AND MANDREL FOR MACHINING SMALL PULLEYS.

Not having a turret or pulley lathe to bore and turn out pulleys, we rigged up to do them on the drill press and engine lathe, as shown in sketches Figs. 1 and 2.

Fig. 1 is the jig for drilling and reaming the hole in the drill press. The distance pieces A are cold-rolled shafting, faced true on the ends and tapped to receive the cap screws that hold the bushing arm to the base of the jig. We use different lengths of these for different widths of pulleys. We cast our pulleys from iron patterns with boss or hub turned true with the rim, and as the bushing fits down over the boss or hub the pulley is centered fairly well. The rim rests on the bottom of the jig, so it is sure to run true on the sides.

We run a three-fluted chucking reamer through first, and then the sizing reamer. We then key-seat them on the drill press with a national key-seating tool. The operator can do these pulleys on a press with power feed and run another one at the same time.

For turning on the lathe we use two mandrels made like Fig. 2. We use two drivers on the face-plate which drive on the projections B, which we find much better than driving on one side only. C is a feather fastened in the mandrel which fits the keyways in the pulleys, thus obviating any tendency to slip on the mandrel. The pulleys are easily changed and by having two mandrels the operator can always have one ready to put in when the other one is ready to take out. We can take a cut all the lathe, high-speed steel or belt will stand and not chatter, and as the boring is done on an inexpensive machine and the lathe kept busy about all the time the cost is pretty well reduced.

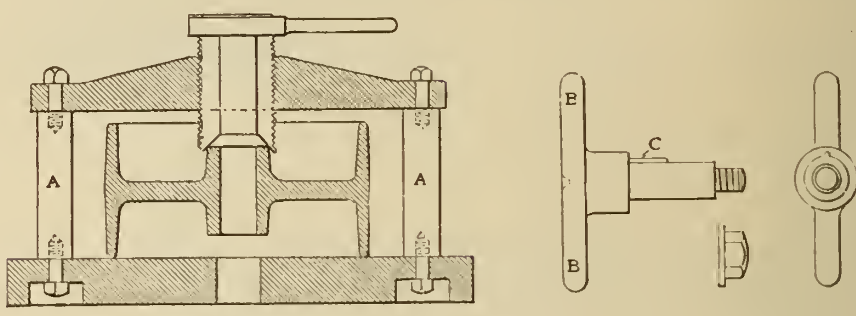


FIG. I FIG. 2

Jig and Mandrel for Machining Pulleys.

We do not claim to beat a Gisholt turret lathe on this class of work, but we are driving it pretty close. We do pulleys 6 inches to 14x6 inches face by this method.—American Machinist.

PORTABLE DRILL SUPPORT.

In building machines which are not made in large enough quantities to warrant the expense of a full equipment

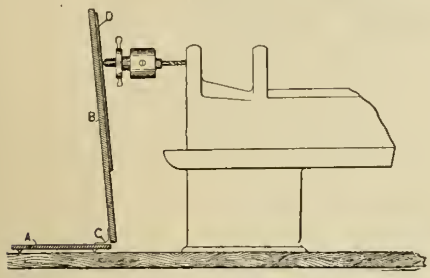


Fig. 1.—Portable Drill Support in Use.

of drilling jigs, it quite frequently is necessary that a number of holes be drilled while assembling various brackets. It is then found inconvenient to use a power radial drilling machine and usually the air or electric portable hand drill is utilized. Under ordinary methods, when the diameter of hole to be drilled is over 5-16 of an inch in diameter, it is considered a rather hard and unpleasant job to both support and feed the drill into the work. The accompanying cuts, Figs. 1 and 2, give a general idea of a supporting device for hand drilling which is used quite extensively in one of the large eastern

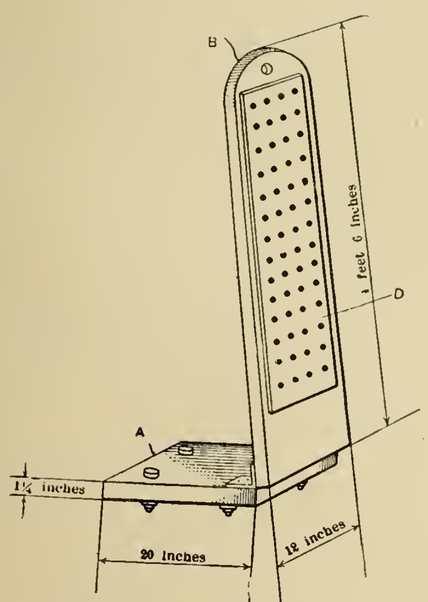


Fig. 2.—Detail of Support for Portable Drill.

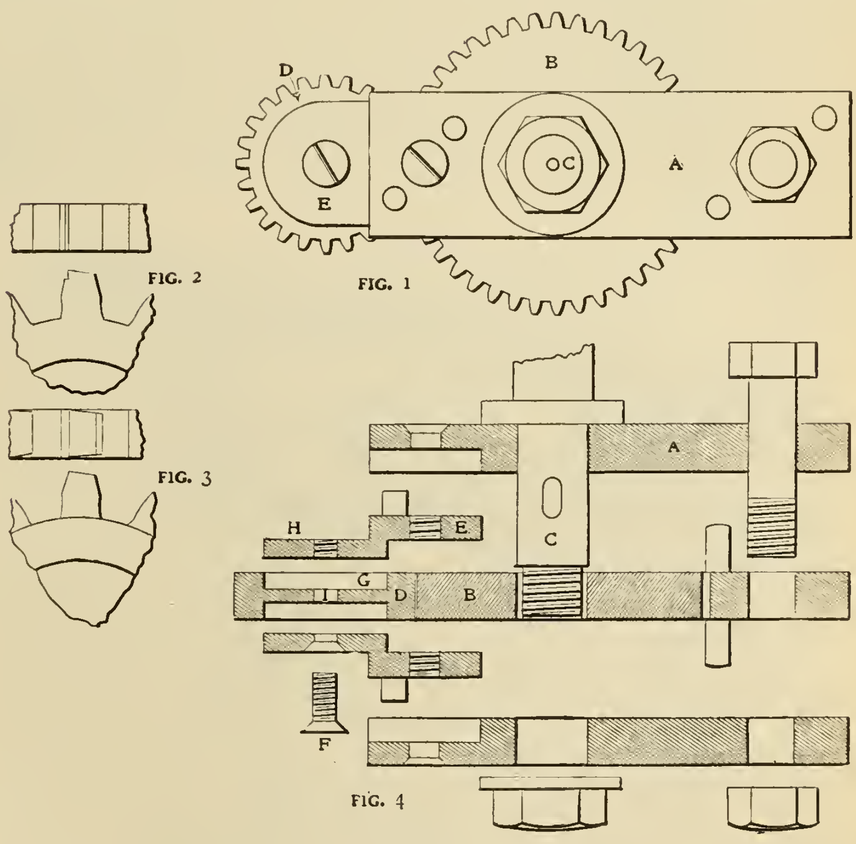
tool building shops and has been found a very satisfactory arrangement.

The support is "made up" of two main parts, a base, A, and a swinging upright, B. These two members are joined by heavy hinges, C. The base has four projecting lugs on its underside which are sharp enough to slightly sink into the floor when the workman stands on the base. When in use the outer end of drilling apparatus is located in one of the many centre holes in the steel plate D, the centre hole selected being one approximately in line with the hole to be drilled. The workman forces the drill into the work by bringing the weight of his body against the swinging upright B. This may seem rather crude but in actual use the lack of "gracefulness" is more than balanced by the ease of manipulation. In drilling holes over 1⅛ inch in diameter, the screw feed is used for feeding, and in this case a sling is thrown over the top of upright B and the work, this simply preventing any backward movements of the upright.—C.L.G.

chine, lathe, drill press, etc., or may be fitted up for a pulley drive

Fig. 1 is a side view of the fixture. A is the frame and must be held rigidly in order to support the cut. B is the driving gear keyed to the driving shaft C. D is the combination cutter and gear; it is cut with a regular involute cutter. It should be located in A, a little over the distance between centres that would be proper for gears running as usual. This is done to avoid breaking teeth off if chips should be carried around.

Figs. 2 and 3 show two ways of obtaining good cutting edges on the cutter. Fig. 2 is best if small cuts are to be taken and sizes must be maintained closely. Fig. 3 shows a very good way of relieving the teeth where heavy cuts are to be taken. These cutters must have a slight side clearance and are ground on the tops of the teeth also.



A SLOT-MILLING FIXTURE

A SLOT-MILLING FIXTURE.

By B. S. Frank.

The accompanying illustrations show a very handy and efficient fixture which, if it were more generally known, would be used very often on awkward and expensive milling and broaching operations.

It will take a cut somewhat deeper than one-half the cutter diameter and has no arbor to be in the way when milling between uprights, etc.

It can be adapted to the milling ma-

They may be ground several times without interfering with their running well in B. B. should be of tool steel and hardened.

Fig. 4 is a sectional view of the parts in position to assemble. A vital point is the fit of the recess G on the carrier E. The face H in E should be a little below the side of the teeth of the cutter D. The hole I in the cutter should be a little larger than the screw F, and F should be screwed up just enough to hold the carriers E to the side of the cutter without pinching it.—American Machinist.

DEVELOPMENTS IN MACHINERY

New Machinery for Machine Shop, Foundry, Pattern Shop, Planing Mill; New Engines, Boilers, Electrical Machinery, Transmission Devices.

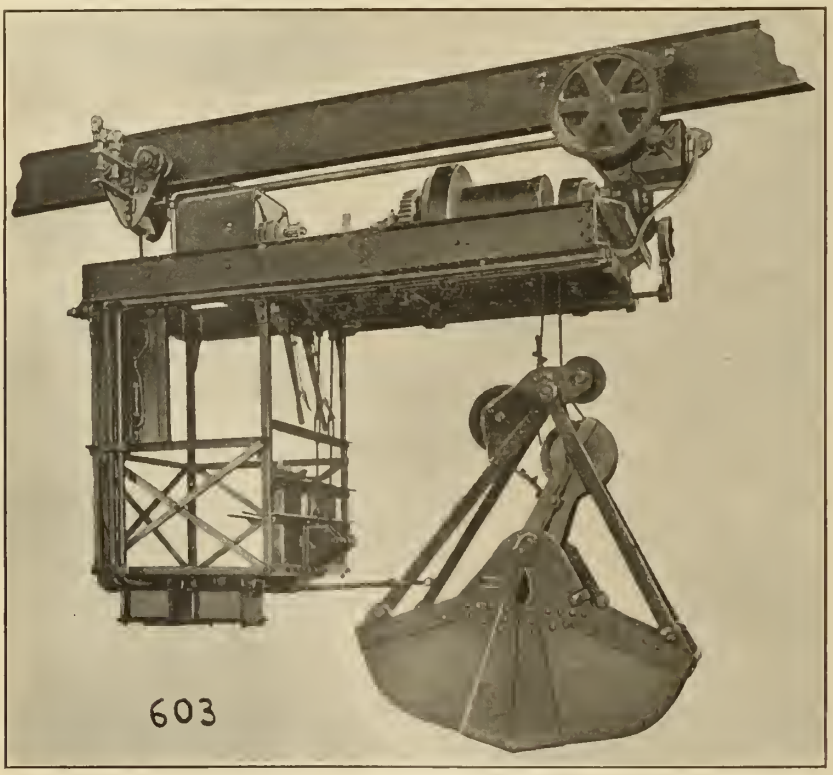
GRAB BUCKET MONO-RAIL CRANE.

The mono-rail crane illustrated herewith is for use on an I-beam runway and is provided with swivel trucks so as to enable it to round a curve of short radius. It is regularly furnished with a two line grab bucket and is very simple and durable.

Special attention is called to the fact that both hoist and holding drums are operated by one motor, by means of friction clutches controlled from the operator's cage. The lowering of the bucket and the operations of opening and closing same are effected by gravity; this method being far preferable to a crane having a separate motor for the hoist and holding line, since the rotative speed of the armature of a series motor in lowering the load will not exceed twice the hoisting speed, whereas with the gravity fall any speed of lowering can be obtained, as the motor is inoperative when the bucket is being lowered or opened. This is an important item, especially on high lifts, and its virtues are at once apparent.

After the bucket has been lowered to the stock pile or car, the clutch is closed, after which time the clutch for the holding drum is engaged and the two are utilized for lifting the load. When the bucket has reached its highest position it is sustained by a self-lubricating mechanical brake of the double friction type, thus eliminating the necessity of the constant care of the operator and the liability of dropping the bucket should his attention be interrupted at any time.

In order to relieve the hoisting clutches of undue wear during the process of lowering the bucket, the hoisting drums are provided with band brakes controlled by foot levers from the operator's cage. The friction clutches used for raising the load act as safety devices in case of over-hoisting, since the clutches are so designed that they would slip before the stresses had reached a dangerous point.



Grab Bucket Mono Rail Crane.

The intermediate hoisting shaft is extended to the rear end of the operator's cage and is provided with a drum that rotates at about twice the peripheral speed of the hoisting drums. This drum has attached to it a rope which extends to the grab bucket and is used for steadying same; not only while in the process of being elevated but after the bucket has reached its final position and is being carried to its destination. The rope is always kept taunt by means of a friction drum revolving between two discs keyed to the shaft with feather keys and held against the drum by means of spiral springs made adjustable for wear and also to vary the pressure between the friction services. The strength of the springs is such as to exert a pull on the steady rope from two hundred and fifty to three hundred pounds as the bucket is being raised or lowered.

A racking motor is attached to the driving truck and its speed is regulated by a drum type controller located in the operator's cage. The travel of the hoist may be made to suit almost any condition, but in ordinary practice a speed of from three hundred to five hundred feet per minute will be found sufficient for coal handling plants, especially where there is a curve or bend in the I beam along the runway.

The treads of the track wheels for the driving and trailing trucks are made spherical instead of cone-shaped, as is sometimes done, the object being to eliminate friction as far as possible, as it is well known that a cone-shaped wheel running on the lower flange of an I beam will have rolling contact along one diameter only, while the other parts of the wheel will be in sliding contact and subjected to undue wear as well as imposing an excessive load on the racking motor.

While compactness is desirable it was considered by the designer to be of secondary importance to accessibility, and although the first has been obtained in a remarkable degree it was at no sacrifice to the second characteristic.

The advantages claimed for this class of coal-handling machinery are: low cost of handling material, as only one man is used to load the bucket, carry it to its destination, empty it and return it to the point of starting; low cost of instalation; a low maintenance charge on account of the small number and size of the working parts; large area served: and low power consumption.

The Mono-Rail Hoist was designed and built by the Cleveland Crane & Car Co., of Wickliffe, Ohio, under the direction of Mr. Thos. B. Davis, M.E., Chief Engineer.

NEW POSITIVE GEARED FEED DEVICE.

The two accompanying illustrations are of the Cincinnati 16-inch engine lathe with three-step cone and double back gear, and the new positive geared feed with which the lathe is equipped. Fig. 2 is a sectional view of this device. With this feed device six feeds ranging from 16 to 100 per inch can be obtained by a simple movement of a lever. These feeds are independent and therefore can be secured without operating the lead screw continually.

It consists of shaft M, to which is keyed bevel gear A that drives pinion B shaft R and worm C. These are supported by bracket G swinging on shaft M, allowing G to move up and down. When gear I or H is meshed with gear J or K on feed rod it gives instantly the six changes, all that are necessary on any 16-inch lathe for general manufacturing. Twenty-two additional feed changes ranging from 5 to 64 per inch are secured by sliding gear W on lead screw in mesh with gear J on feed rod. The 4-pitch steel lead screw cuts threads 2 to 24 per inch, including 11½. An unlimited range of feeds may be secured by ordering extra change gears for screw cutting. Safety stop U prevents both feeds becoming engaged at same time. By placing pin P into holes in gear casing retains worm C in mesh with worm gears D, E and F. Fork T is used to shift the worm wheels into mesh with worm C. A reservoir holds oil for these gears to pass through constantly.

Fig. 1 shows the lathe, which is furnished with plain or compound rest, centre and follow rests, large or small face plates, and a self-oiling friction countershaft. The taper attachments travel with the carriage and may be added to the lathes at any time after installation, and permit turning tapers from zero to four inches to the foot and twelve inches long, with one setting. These machines are also furnished with draw-in attachment, oil pan, turret on carriage and with either three or five-step cone.

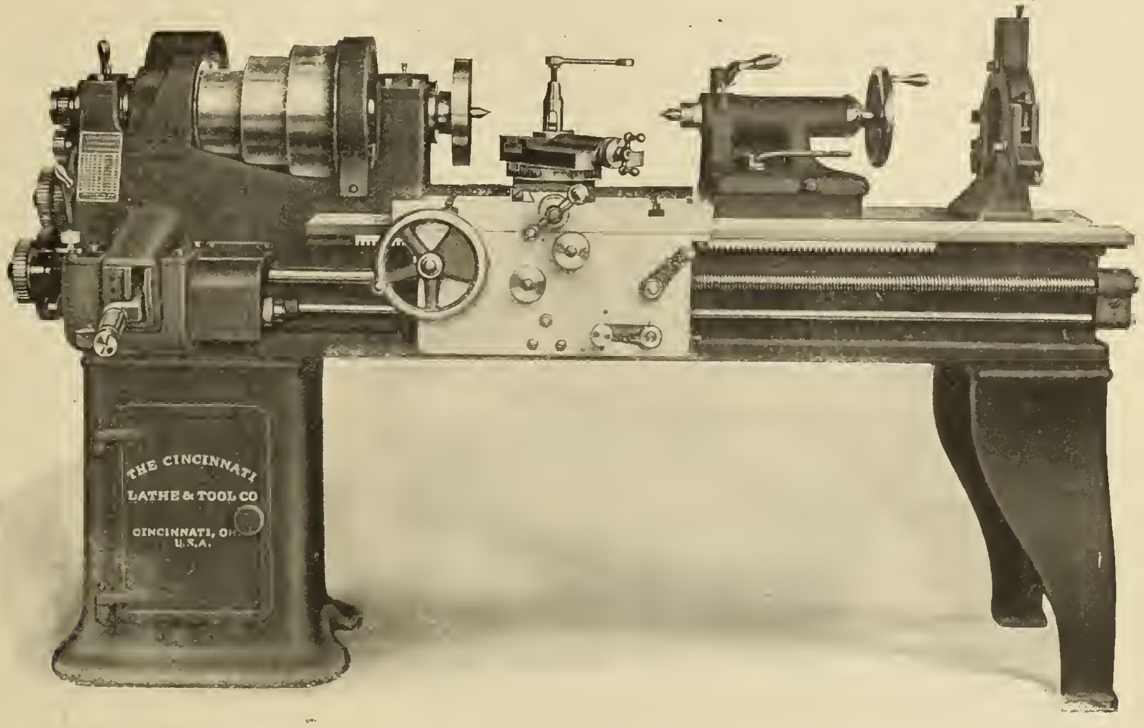


Fig. 1.—Cincinnati Lathe Fitted With New Positive Geared Feed Device.

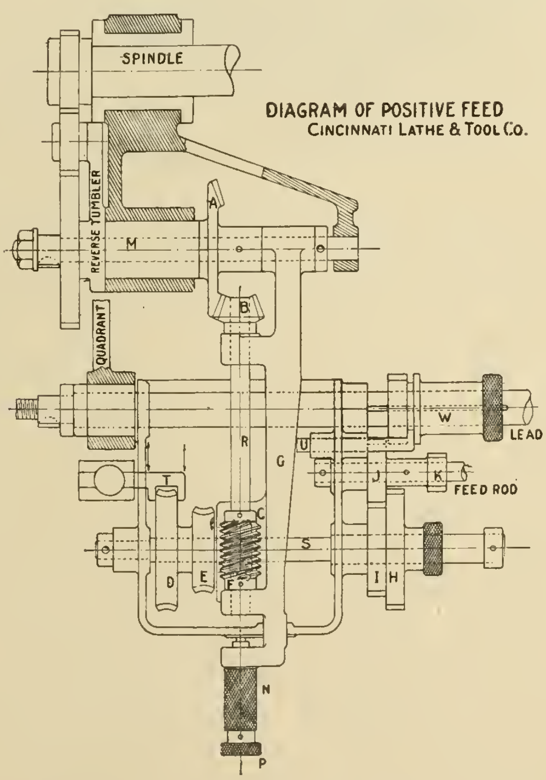


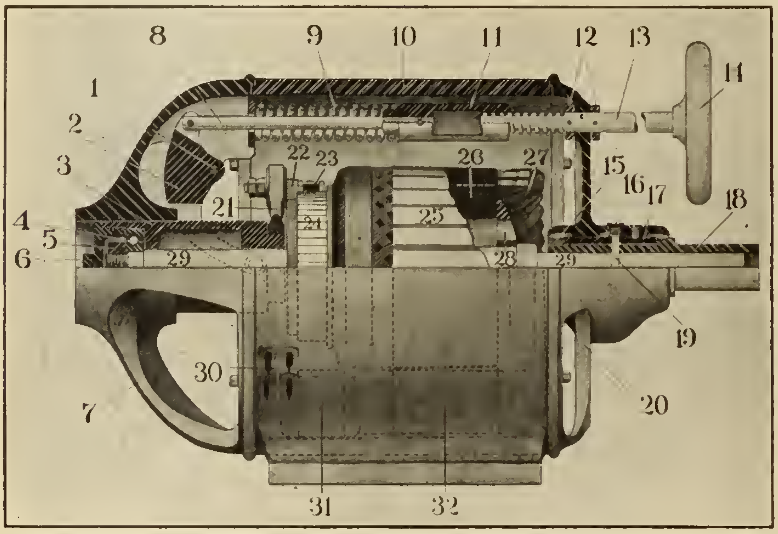
Fig. 2.—New Positive Geared Feed Device.

THE LINCOLN-VARIABLE-SPEED MOTOR.

The accompanying illustration is a cross section of a variable speed motor, in which the speed is varied by a variation in the strength of the magnetic field in which the armature rotates. In any motor the speed of the armature varies directly as the voltage across the brushes and inversely both as the number of turns of wire in the armature winding and as the strength of the magnetic field within which the armature rotates. The limitations and disadvantages of speed variation by varying the impressed voltage.

The strength of a magnetic field varies directly as the strength of the field coils energizing the iron or steel and inversely as the magnetic reluctance of the magnetic circuit. The magnetic reluctance of a magnetic circuit corresponds to the resistance of an electric circuit. Lines of magnetism traverse air with great difficulty, iron very easily, and steel still more readily. In a motor, the magnetic circuit, or path followed by the lines of magnetism, starts in a field pole, crosses the air-gap to the armature, traverses the armature to the next pole piece, again crosses the air-gap, and returns by the second pole piece and motor frame to its starting point. By far the greatest part of the magnetic reluctance of this entire circuit is at the air-gap, and any change in the length or area of the air-gap produces almost proportionate changes in the strength of the magnetic field within which the armature rotates and consequently in the speed.

In a Lincoln variable speed motor, both the armature and the inner faces of the pole pieces are given a slight taper. Both represent surfaces of truncated cones, one within the other, with the shaft as axis. Any lateral movement of either parallel with the shaft increases or decreases the distance between the two surfaces corresponding with the air-gap. The normal position of the armature is directly beneath the pole pieces and in this position the air-gap is a minimum. Gradually withdrawing the armature laterally, not only gradually increases the length of the air-gap, but also decreases its area; that is, the area of the air-gap no longer corresponds with the total area of the inner face of each pole piece, but with the decreased area now lapping the armature. Both effects produce a gradual increase in the magnetic reluctance, a gradual decrease in the strength of the magnetic field within which the armature rotates, and a gradual increase in speed. On account of the cone-shaped form of the armature and pole pieces only a slight lateral movement is required to produce wide ranges in speed, even as high as one-to-ten.



The Lincoln Variable Speed Motor.

One of the most serious problems met with in the design of this motor was some method of overcoming the strong tendency to spark at the brushes as the armature is withdrawn laterally into regions of weaker field. To meet this difficulty special commutating holes use energizing coils are in series relations to the armature are provided, laterally displaced from the main field poles on the side towards which the armature is withdrawn. A two-fold result is thus accomplished. Not only does the commutator effect, at all time and with all positions of the armature, vary with the load, due to serious relations of the coils, but on account of the lateral displacement of the poles the armature as it is withdrawn into regions of weaker field, comes more and more under the influence of the special commutating poles, giving an increased commutating effect, as the strength of the main field decreases. In both cases the commutating effect produced is in direct proportion to the commutating work to be done. The result of this is sparkless commutation up to 50 per cent. overload when running at any speed.

Referring to the accompanying illustration, it is seen that the armature shaft at the driving end of the motor slides within a revolving sleeve on which a pulley or pinion may be mounted in the usual manner. The shaft is key-seated and slides on a feather key of liberal proportions, this feather key being seated in and pinned to the inner face of the sleeve. The sleeve does not move laterally as the armature is shifted for speed adjustment, but is held in position by a shoulder at one end and a circular nut at the other bearing against the two end faces of the bronze bearing bushing. These shoulders take up very satisfactorily any end thrust imparted to the sleeve by the shifting of the armature.

At the commutator end, the armature shaft is supported by a combined radial and thrust ball-bearing completely enclosed and protected from all dirt. The inner race of this bearing is clamped between a shoulder and nut at the end of the armature shaft and the outer race is similarly fastened within the sliding thrust bearing box. The brush rocker arm is mounted on the inner end of this box. It is evident that any lateral movement of the sliding thrust bearing box imparts a similar movement to the armature and that the thrust bearing box, rocker arm, brushes and armature, move in unison.

A forked lever, pivoted between two lugs projecting from the inner face of an arm of the end yoke, engages on each side of the thrust bearing box at the end toward the armature. The outer end of this lever is pinned to a short rod which in turn is securely fastened to one end of the speed adjustment nut. A small shaft, on which a hand wheel is mounted outside the pinion end yoke, passes through an arm of this yoke and engages at its threaded inner end with the speed adjustment nut. This shaft is prevented from moving laterally by collars both inside and outside its bearing in the end yoke. Turning the hand wheel, therefore, imparts lateral movement to the speed adjustment nut, and this, in turn, by means of the rod and lever, imparts a similar movement to the thrust bearing box and armature.

It merely requires a few revolutions of the hand wheel to shift the armature throughout the entire speed range of the motor. The movement of the armature with a slight turn of the hand wheel is hardly perceptible, and it is therefore possible to adjust the speed with any degree of accuracy desired.

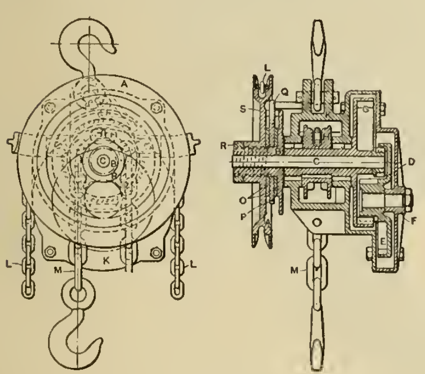
With the turning of the hand wheel there is a smooth, gradual and continuous change in the speed of the motor throughout its entire range.

This motor is made by the Lincoln Motor Works Co., Caxton Bldg., Cleveland, O.

NEW LINE OF CHAIN BLOCKS.

A new line of hand-power chain blocks has been placed on the market by the Climax Hoist Co., 1753-55 N Howard St., Philadelphia, Pa., which is simple in construction, and which has many points of advantage, the builders claim. The accompanying illustration shows the construction.

The hand-wheel A is threaded to the hub of the friction plate B, the latter being fast to the driving shaft C. To the other end of C is fastened the driving pinion D, which meshes with the internal gear E, mounted on a stationary stud supported by the cover F. The teeth of the pinion formed on the hub of E engage the internal teeth of the load gear G, on whose extended hub is keyed the load chain sprocket H. The long hub on G is supported by roller bearings at J and J in the main frame K; this hub also serves as the bearing



New Line of Chain Blocks.

for driving shaft C. Gears G and E run submerged in oil in casing F.

It was stated that sprocket wheel A was threaded to the hub of friction plate B. This is required by the automatic brake mechanism, which is provided to keep the hoist from running backwards under a heavy load when the workman releases the hand chain L. In lifting work by the hand chain the sprocket wheel is turned in a clockwise direction, as indicated in the sectional view, Fig. 2. In doing this it is screwed inward on the hub of B until it clamps between the flange on B and its own web friction washers O and ratchet plate P, thus making A, O, P O, and B revolve as a solid unit, raising the work through the medium of the gearing previously described. If the hand chain is released, the load tends to revolve shaft C and friction plate B backwards. This, however, is prevented by the ratchet teeth on P which engage with the pawl Q, which is fast to the casing of the hoist. By this means the rotation of C is prevented and the work remains safely suspended.

When the operator desires to lower the load, the left-hand side of the chain L in Fig. 2 is pulled, revolving the sprocket in a counter clock-wise direction. This unscrews sprocket A on the hub of B from contact with friction washers O and ratchet P, leaving B and drive shaft C free to be revolved by the load, which is thus allowed to descend. If the load has been removed so that there is not enough weight to cause the mechanism to run back by its own weight, the continued pulling of the left-hand chain screws the sprocket wheel against collar R on the hub of B, which is thus positively revolved in the proper direction to lower the hook.

On the other hand, if the workman has been lowering the load as previously described, and he removes his hand from the chain, the mechanism is positively braked as follows: The turning of the hand-wheel by the operator in a clock-wise direction having ceased, this latter is quickly brought to a stop by the action of friction plug S in pawl Q. This friction plug serves the double purpose of arresting the movement of sprocket-wheel A, and of keeping the pawl in contact with ratchet plate P when required. The plug is forced against the web of A and the flange of B by a spring in its interior. Wheel A thus being arrested and the motion of B continuing under the weight of the descending load, A is immediately screwed inward on the threaded hub of B, clamping friction washers O and plate P, thus arresting the movement of all of these parts parts against pawl Q. When the wheel is being revolved in the opposite direction friction plug S raises pawl Q so that there is no disagreeable clicking sound, as would be the case if it were held in contact with the ratchet by a spring. As soon as the wheel starts to revolve in the other direction, however this same plug brings it quickly into contact with the ratchet.

The points of superiority claimed for this design of hoist are—low cost, due to the few parts and simple construction, high efficiency also resulting from the simple construction, from the use of roller bearings for supporting the load, and from the fact that the gears are enclosed and run in oil; and durability. The parts are all interchangeable so that suuperior construction is attained at low cost, and repairs are easily effected.

This hoist is arranged with different load chain connections, in seven sizes, to lift from 1,000 to 10,000 pounds.

NEW REVOLUTION COUNTER.

Paterson, Jenks & Co., 91 Youville Square, Montreal, who are Canadian agents for the Schuchardt & Schutte, of Berlin, have placed upon the market a unique specialty of the latter firm in the shape of a handy and easily registering counter. This instrument has advantages over other indicators which are apparent at first sight, and must commend the article to all users. The "Initiative" revolution counter will register from 0 to 10,000 in either direction and will then repeat. It can easily be set to zero from any number. The count is read like an ordinary number, all digits being lined up in a row. This feature is not found in any other indicator, and has many advantages over the puzzling way of reading with a pointer and dial. Its compact size, its easy way of registering and the fact that the recording does not need to be read backwards make the counter most perfect, durable, and handy. Schuehardt & Schutte have issued a nicely illustrated catalogue of their various lines of pliers, pincers, folding rules, etc. The different grades are concisely set out, and with the accompanying cuts the catalogue is most handy, not to say, instructive. These catalogues can be obtained by writing to Paterson, Jenks & Company.

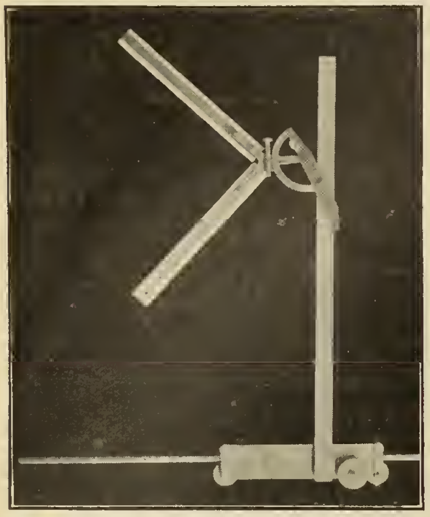
New Revolution Counter.

A NEW DRAFTING INSTRUMENT.

The Emmert Mfg. Co., of Waynesboro Pa., have undertaken the manufacture and sale of the Noyes Vertical T-Square, a drafting instrument of considerable novelty.

This instrument, of which the name is descriptive, comprises a vertically arranged T-square, guided at the top of the drawing board and having a protractor with scales sliding vertically thereon. The head of the T-square is provided with a set of four rollers

guided upon a straight steel track, which is fastened to the top of the drawing board. One pair of these rollers is bevelled, and runs on ball-bearings, so arranged that the weight of the head holds it upon the track with absolutely no lost motion, making possible



A New Drafting Instrument.

a very free and sensitive movement The head also carries a spring balanced drum to which is attached a cord which connects with the vertically sliding protractor and acts to hold the latter to the blade.

The protractor is also guided upon the blade by rollers, giving it a very sensitive vertical movement. It is thus evident that the instrument always moves in horizontal and vertical parallel lines.

Pivoted to the sliding protractor is a forked arm to which interchangeable scales are attached. This arm is provided with a worm which engages notches cut in the rim of the protractor and which can be quickly pressed out of engagement therewith. These notches are spaced three degrees apart thereby making possible an instantaneous setting of the instrument to any multiple of three degrees, which includes all the most commonly used angles: 0, 15, 30, 45, 60, 75 and 90. The 3-degree angle is exceedingly handy, as it is the usual draft given to patterns is suitable for the conventional angle used for showing screw threads and various other cases.

To obtain fine adjustment, the neck of worm is graduated with 12 divisions, so that one division represents ¼ of a degree. One-half of this, or ⅛ degree can be easily read, which is as fine as is ever necessary for drawing. Interchangeable scales are provided, furnished with any desired graduations.

In addition to the obvious advantages of the instrument for the horizontal board, it is practically indispensable for the vertical. It combines T square, protractor, scales and triangle into one self-contained whole, depending from the top of the board, while with the old arrangement one of these articles is usually on the floor, and the rest scattered along the parallel rule.

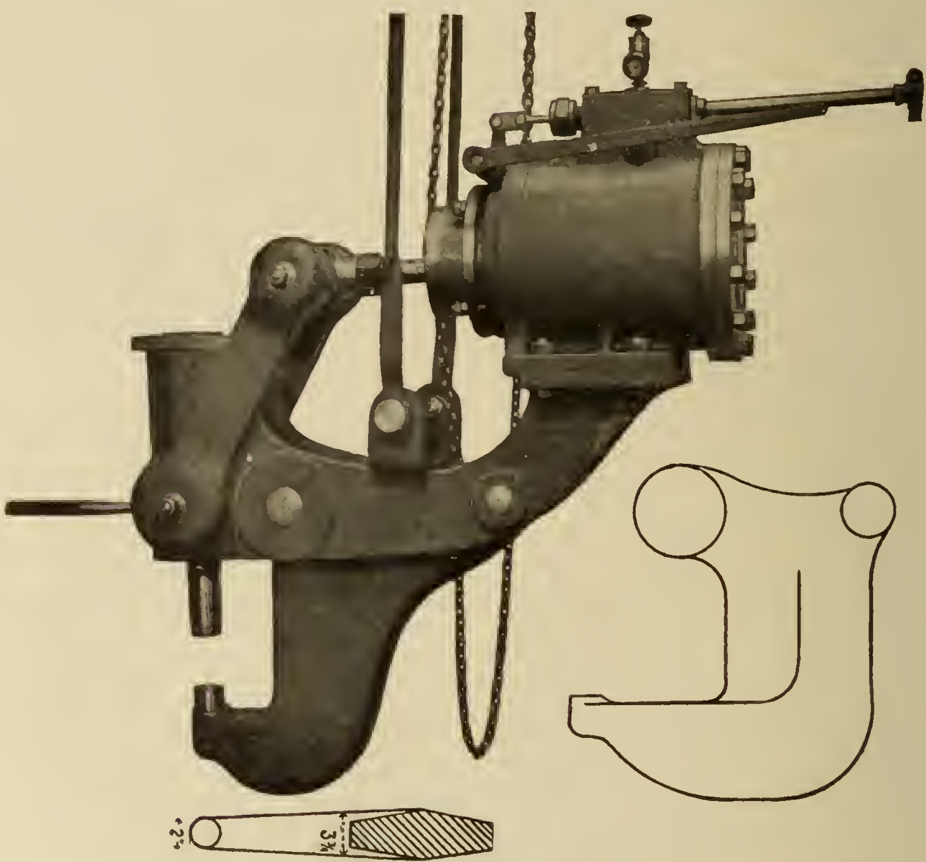
It eliminates the use of the parallel rule, with its inaccuracies and troubles and its speed and accuracy in making projections alone will pay for its instalation.

A further extension of its use is in the making of large drawings. One illustration shows an application to a board for making 6 ft.x10 ft. drawings. With this outfit it is possible to make full size drawings of quite a large machine with the same ease, accuracy and speed as on a 24x36 board.

The advantages of this outfit will be readily apparent to every designer. Full size assembled drawings, with every part standing up in its natural and normal life size position, furnish almost the same advantage as a model. With such a layout the location of operating mechanism and handles can be tried, and their convenience and accessibility can be determined and a more accurate scale layout is always possible when full-sized scale is used.

INTERCHANGEABLE STAKE LATTICE RIVETER.

A riveter, the frame of which may be altered to suit different conditions of work, possesses obvious advantages. Especially is this true of the lattice riveter, which must do its work in places difficult to reach. The frame must be of such shape that the portion which opposes the thrust of the machines can be introduced into the interstices between the bars and angles making up the lattice. The new interchangeable stake lattice riveter, manufactured by John F. Allen, 370-372 Gerard Avenue, New York, is designed to meet these conditions. The machine here shown, weighing 1,200 pounds and fitted for 1¼ rivets, is the size now regularly supplied, although designs for a smaller machine are in course of preparation. The cylinder is 12 in., the reach 6 in., and the gap 12 in. It is operated with a pressure of, from 70 to 100 pounds to the square inch. The cylinder and the working parts have all the latest improvements found in the Allen riveters of other designs.



Interchangeable Stake Lattice Riveter.

The special feature of this riveter is the interchangeable stake, the lower portion of the frame attached to the main body by means of two pins. The dimensions of this stake determine the gap and the reach of the machine, and by substituting another of a different design the riveter may be made to suit widely varying conditions of work.

FOUNDRY PRACTICE AND EQUIPMENT

Practical Articles for Canadian Foundrymen and Pattern Makers, and News of Foundrymen's and Allied Associations. Contributions Invited.

THE METAL MARKET.

There has undoubtedly been a brighter tone to the markets generally this month. Quotations, for the time being at any rate, have strengthened, and but for the element of speculation which entered the New York copper market, and which now shows a tendency to produce a reaction, little cause for complaint can be found, especially considering that August is a dull season for metals as it is for other lines. Locally there has been a good improvement in demand. The buying is still of a hand-to-mouth description, but the orders are heavier, and buyers are closer to the market than they were. Merchants express themselves satisfied with the trade doing. There have been no signs of a big jump in the demand, and some authorities do not expect this at all, but conditions are certainly improving, and if the primary markets do not get ahead of conditions (that is bull prices beyond any actual business improvement) there should be a strengthening movement right through the fall.

Just at present there is a slight reaction in copper which only bears out the importance of keeping prices within bounds. Copper on a stimulated demand in New York, backed up by the confidence of producers that the metal would eventually reach a much higher price, has been soaring ahead. For the time being the English market also became steady, and with an upward tendency. Copper shares rose strongly, and the consequence was that casting copper reached $13.50. Unfortunately an element of speculation has crept in, which has threatened the real improvement of the metal. The demand has been improving, but not to the extent apparently to warrant the strong tendency to boost quotations. In consequence there appears to be a slight reaction just at present. Whether it will become worse, or will give way to a strengthening movement again, we cannot say. It all depends upon the demand, and the nature of the speculation going on. Quotations have been advanced in Canada 50c during the month. and casting copper is now between $14 and $14.50.

Tin has continued to jump up and down in the English market, dragging New York prices with it. The bulls have been continuing their fight, and have been on top most of the time. The metal just now is somewhat low again, but there is little dependence to be placed on the market. There is one thing certain, that the demand generally has been on the quiet side in England and the States. Speculation has alone kept tin high. In Canada the metal has been in very fair request. In fact during the last week or so some very good orders have gone through. Prices, with the bulling movement in London, naturally stiffened and quotations now range from $32.59 to $33.

Pig iron shows improvement all the way round. In the States, in a general way, the situation has strengthened. The Southern market is firmer, and producers are not at all anxious to contract for delivery at the end of the year. Selling is more active, and a rise in prices is predicted in some quarters. The railroads are asking for prompt delivery on fairly large orders of track materials, which has the effect of strengthening the position of pig iron producers. The English and Continental markets continue quiet for finished material, but there is a good demand for pig iron, especially in the former country. Notwithstanding fears as to a falling off in demand, the price of standard warrants has continued at a high level. Scotch brands are holding their own well. Good Canadian orders have been placed for delivery during the balance of the summer season, and although there has been some price cutting, generally quotations have remained unaltered.

Spelter has likewise improved during the month. The primary markets have strengthened somewhat, although the metal is in the unfortunate position of suffering from over-production in the past and the moment the market gets firmer under a better demand these stocks are unloaded and the price goes back. With fair business doing, Canadian prices have been advanced from $5 to $5.25.

Lead has strengthened also and has been well over the £13 mark in England. The metal is very uncertain, however, and with the consuming demand in the Old Country somewhat irregular, it is difficult to gauge the strength of the market. The Canadian demand has improved, and prices have advanced to $3.70 and $3.75.

Uniform Foundry Costs: Chart and Connecting Data

A Memorandum Prepared in Connection with the Chart Submitted by the Costs Committee of the American Foundrymen's Association *

By ELLSWORTH M. TAYLOR

The chart submitted by the committee has been made as simple as possible, and is designed to illustrate merely the elementary principles of the burden or sur-charge distributions agreed upon as the standard units to be used by all foundrymen.

It is not intended to be a complete cost system in itself, nor should the arrangement of the items in the different sections necessarily be maintained, so long as the various kinds of labor and material are distributed to individual costs in accordance with the formula shown.

Briefly stated, it has been determined that, in order to correctly obtain the cost per pound of good castings, according to classes or individual patterns, after the cost of the metal and direct or applied labor has been ascertained, certain kinds of burden or surcharge labor and materials must be distributed to each class into which the product may be divided in two general ways:

(1). According to weight of good castings.

(2). According to a percentage of the direct or applied labor used in producing each class.

And in order to get a clearer insight into the subject let us discuss the various sections of the chart in the order in which they occur. We will then take up in a general way the application of the principles to different kinds of foundries.

* Part of the report of the Committee on Costs—Convention of American Foundrymen's Association, Toronto, June, 1908.

Metal

This section of the chart requires little explanation. It is simply necessary for the foundryman to make up his report showing the cost of the metal actually consumed in the making of the good castings produced.

This means a fairly close check on what goes into the cupola, and what we ultimately get out of it.

Burden or Sur-charges on Metal Distributed to Classes on Basis of Weight.

This section of the chart shows in a general way the kinds of labor and materials which will be distributed to classes or individual patterns in accordance with the weight of good castings into which the product may be divided.

In studying the items named in this section of the chart it should be remembered that the arrangement is perfectly elastic, and may be modified and enlarged upon according to the individual requirements and desires of each foundryman. The examples given are merely to illustrate the kinds of labor and materials which are to be included in this section.

It is suggested, however, that in arranging the items in this section the foundrymen group together those expenditures which relate to the successive steps through which the metal passes from the pig up to the finished castings.

For example:

1. Cost of metals delivered at yard.
2. Cost of materials and all expenditures to cupola.
3. Cost of materials and labor to cover molten iron in ladle.
4. Cost of moulding supplies and all items incidental to the same.
5. Cost of all general and miscellaneous items which must be distributed into the costs on a basis of weight of good castings.

The total cost of these items when divided by the weight of the good castings gives the number of cents per pound of burden or sur-charge cost to be apportioned to each class of castings or individual patterns into which the production may be divided.

The grouping of the items in this way is to enable the foundryman to analyze his costs logically and make comparisons for the purpose of detecting excessive expenditures.

It is sometimes the wish of the foundryman to group these and other items so as to put the responsibility for the economical handling of the iron in the various stages up to certain foremen or individuals.

All of these matters, however, must be decided according to individual desires and conditions.

Direct or Applied Labor.

The subdivisions in this section are merely suggestive. The list must be added to or decreased to meet conditions. As stated in the note, it is not always possible to class all of the labor of these employees as direct or applied labor, and likewise it is sometimes possible to class all or part of the labor of pattern makers, carpenters and blacksmiths as applied or direct labor.

The rule is that all labor is direct or applied when capable of direct distribution to any class of castings or individual patterns, and when it would be included as a direct labor charge in making up the cost of an individual job. Otherwise the labor items must be classed as burden or sur-charge cost.

The foundryman should be careful to observe this rule when figuring detail costs, as the percentage of burden or sur-charge apportioned to individual costs on a basis of direct or applied labor is obtained by dividing the total cost of the section—"Sur-charge on applied labor distributed on per cent. basis" by the total of the "Applied labor" section.

Therefore, if we include in the applied labor section any considerable amount of labor which does not come within the above named definition of direct labor, we are apt to develop a percentage rate which will not cover our real burden or sur-charge.

Commercial Costs.

This section is intended to cover all costs beyond the shipping office door which have to do with the selling of the product.

Consequently item 80 of the chart — "Administration"—should be understood to mean only that portion of the executive cost which is used for the benefit of the selling department. The balance of the administrative cost should be included in item 66—"Proportion of general office expense"—or may be made a separate subdivision thereof.

Item 81 of the chart—"Sales costs"—may be sub-divided as each foundryman desires; for example, salesmen's salaries, salesmen's commissions, travelling expenses, etc.

In apportioning the commercial cost to the classes into which the product may be divided, the unit of distribution should be made up on a basis of equity, taking into consideration the real conditions governing the sale of each class, such as the amount of sales, the costs up to the "Commercial costs section," the difficulty in making sales, the volume of advertising, etc.

Individual conditions must be carefully studied before the unit of distribution for this class of costs is adopted.

Summary of Costs.

After completing the arrangement of the sections described above we are in a position to secure a summary of costs which may be drawn up as submitted below, changing the arrangement to meet individual conditions.

The grand summary will be based on the following data:

(1) Total good castings produced.
(2) Cost of metals used.
(3) Cost of applied labor.
(4) Cost of total sur-charge divided into:
 (a) Cost of items to be distributed as "sur-charges or burden on metal distributed on basis of weight of good castings."
 (b) Cost of items to be distributed as "sur-charges or burden on basis of per cent. of applied or direct labor."
(5) Total cost of output.
(6) Commercial costs.
(7) Gross cost of output.
(8) Net cost of metals used per pound of good castings; obtained by dividing item 2 by item 1.
(9) Burden or sur-charge to be distributed to individual costs on a basis of per pound of good castings (obtained by dividing item 4a by item 1).
(10) Burden or sur-charge to be distributed to individual costs on a basis of per cent. of direct or applied labor (obtained by dividing item 4b by item 3).

The examples given in this schedule illustrate the classification of costs necessary for all kinds of foundries and must be used to meet the conditions in the five general classes of foundries described below, and all others.

The Small Jobbing Foundry Selling Its Entire Product to the Trade.

This foundry wants to know:

(a) What is the gross cost of production? See items 5 and 7.

(b) How should we figure the cost of an individual casting? Multiply the weight of casting by item 8. Get the cost of the direct or applied labor used to produce the casting. Multiply the weight of casting by item 9. Multiply the direct labor by the percentage rate obtained by item 10. The total of these amounts is the cost of the casting up to the shipping office door. Add the proper proportion of item 6. The total is the gross cost of the casting.

(c) Suppose it is desired to divide the production into two or more

(NOTE.—The numbers and letters used in this paper do not refer to the numbers against the items on the chart except where specifically stated. They are used here to permit of a logical arrangement and for the purpose of cross reference within the paper itself.)

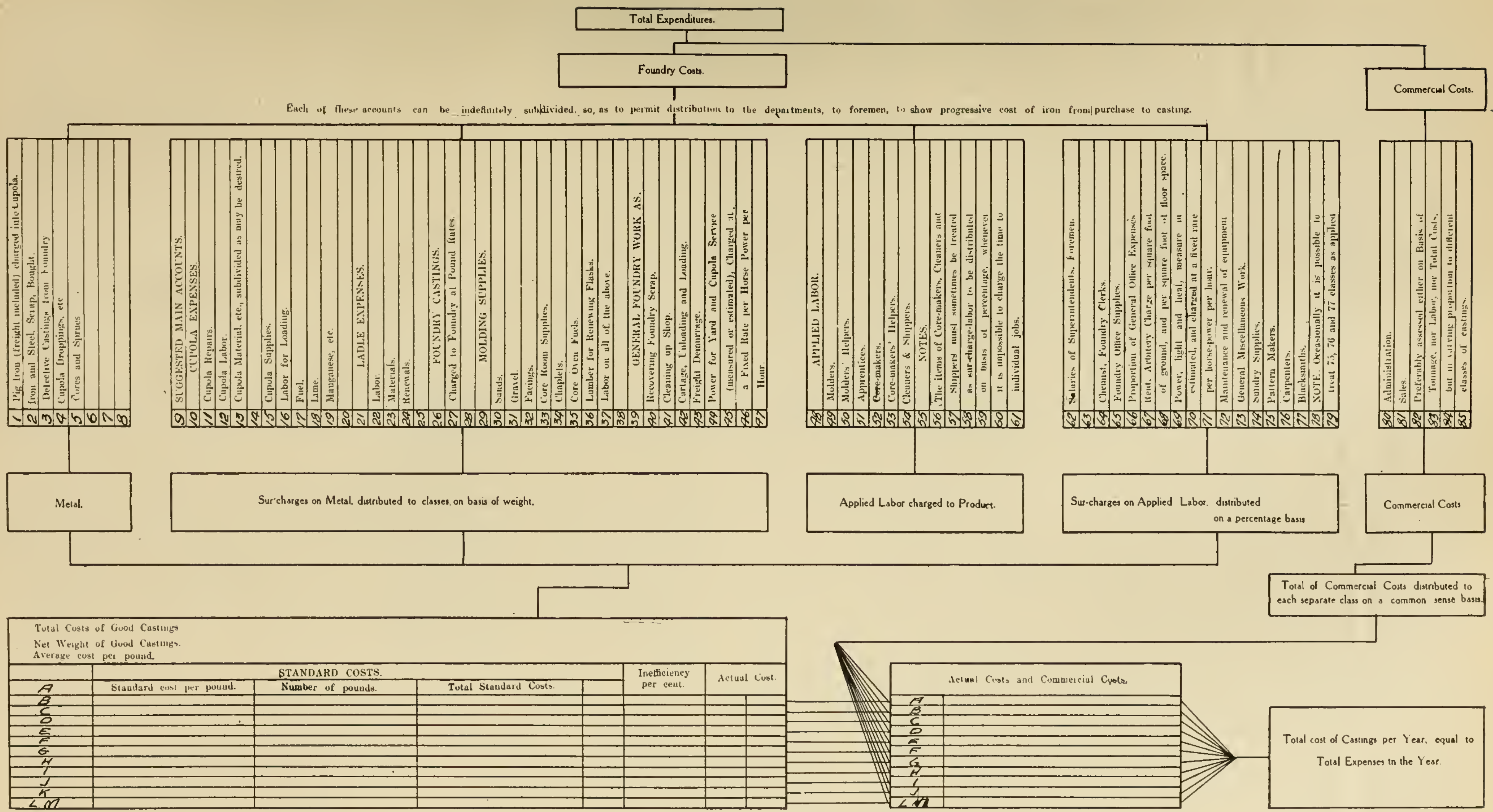


Chart on Uniform Foundry Costs, Submitted by the Cost Committee of the American Foundrymen's Association.

classes, say for example "heavy work" and "light work" so that we may obtain the average cost of these classes without getting the detail cost of each casting? Separate item 1 into "heavy work" and "light work." Keep a record of amount of item 3 used for each class. Then proceed exactly as outlined for b.

(d) Suppose it is desired to secure the cost of Smith's work, Jones' work, and Brown's work, to find out which is the most profitable, and without getting the detail cost of each casting? Separate item 1 according to customers. Keep a record of amount of item 3 used for each customer. Then proceed exactly as outlined for b.

The Jobbing Foundry Large Enough to Be Divided Into Two or More Distinctive Departments.

(e) Suppose one section of a plant is continually producing large loam castings, and another section produces machine-made castings? Treat each department as a separate business proposition. This means:

Separate item 1 according to departments. Separate item 3 according to departments. Separate item 4a according to departments. Sub-divide 4a. First, according to those expenditures capable of direct charge to each department. Second, according to those expenditures incapable of direct charge to each department.

Examine carefully all of the items in the second sub-division of 4a, take into consideration all of the conditions prevailing in each department and apportion the amounts in accordance with the units of equity which the examination develops.

Separate item 4b according to departments. First, according to those expenditures capable of direct charge to each department. Second, according to those expenditures incapable of direct charge to each department.

Examine carefully all of the items in the second sub-division of 4b, take into consideration all of the conditions prevailing in each department and apportion the amounts in accordance with the units of equity which the examination develops.

Separate item 6 according to departments. First, according to those expenditures capable of direct charge to the sale of castings from each department. Second, according to those expenditures incapable of direct charge to each department.

Examine carefully the items in the second subdivision of 6 and distribute the amounts in accordance with the general instructions given under the heading "Commercial costs."

When the above distributions have been made we will find ourselves in possession of two sets of reports. Then proceed exactly as outlined for b in order to obtain any detail information.

The Foundry Selling Its Entire Product to Its Own Machine Shop.

With this class of foundry the first step is to treat the two properties as separate institutions. Draw the line sharply between expenditures made for each property, and consider the foundry as an outside concern.

Fix the selling prices of the castings to the machine shop taking into consideration general market conditions. and the fact that the foundry will be relieved of the usual commercial or selling expense. The foundry must then operate within these theoretical selling prices in order to be profitable.

The next thing to consider is whether the foundry is large enough to warrant sub-dividing it into departments.

If it is not necessary to make these departmental subdivisions we will obtain our costs and detail in the same general manner as outlined for a and b.

If a departmental subdivision into departments is advisable for any reason proceed in the manner outlined for e.

The Small Foundry Selling Part of Its Product to the Trade for Cash and the Balance to Its Own Machine Shop.

This class of foundry may be handled in several ways, the suggested division of the production being:

1st. Cost and profits on castings sold to outside customers.

2nd. Cost and profits on castings sold to machine shop.

To get this information proceed as outlined for d, being careful to apportion the commercial or selling costs as between the two divisions of the product.

If we wish to obtain detail costs proceed as outlined for b and by posting these costs against sales we may get profits on individual jobs or by any class desired.

If we desire to divide our product first into perhaps "heavy work" and "light work" without going into the detail cost of each job, proceed as outlined for c. And if it is still our wish to secure figures in the broad divisions of:

1st. Costs and profits on castings to "outside customers."

2nd. Costs and profits on castings to machine shop.

we must divide 1 and 2 into the pounds of "heavy work" and "light work" in each class, and multiply the amounts by cost as developed by c.

If we further wish to sub-divide costs of "work for outside customers," by customers, such as Brown's work, Jones' work, etc., we must know the pounds of "heavy work" and "light work" produced for each. Then multiply the amounts by the cost developed by c.

The Large Foundry Capable of Sub-Division Into Departments and Selling Part of Its Product to the Trade for Cash and Part to Its Own Machine Shop.

This class of foundry has the greatest complications and likewise the greatest possibilities for the application of the principles enumerated, and as its costs will be determined primarily by a combination of the illustrations given, it does not seem necessary to go into much description.

A careful reading of the outline for e and for "The small foundry selling part of its products to the trade for cash and the balance to its own machine shop" should give a clear idea of points to be covered.

General Remarks.

In reading this paper it should be borne in mind that the intention is to illustrate correct principles of distribution and not to outline a complete cost system.

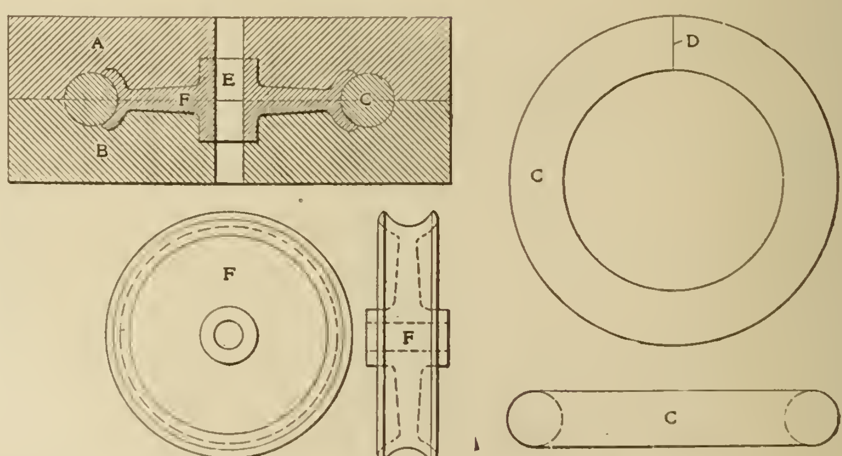
No attempt is being made to deal with the subject of handling of patterns, the handling of orders, the handling of metals, the record of stocks, the books of account, statistics, etc.

All of these matters come under the heading of a cost system, and they were treated of in a general way by the writer in the paper prepared for the convention of the American Foundrymen's Association held in New York City in June 1905.

CASTING GROOVED PULLEYS IN A TWO-PART MOLD.

By E. A. Dixie.

We had some white-metal grooved pulleys F to make. At first a simple two-part mold was made which produced a casting with a flat face, the groove being turned afterward. The first lot being satisfactory a larger order was given and I had almost decided to make some elaborate three-part molds when the mold shown in section occurred to me. A and B are the two halves of the mold, C is a wire ring split at D. This ring was a snug fit in the mold. It was made of 3-16-inch wire and was about 4 inches in diameter. A drill-rod spindle E was put through the two parts from side to side and was forced



Casting Crowned Pulleys in a Two-part Mold.

out under an arbor press after casting the grooved pulley. The pulley F and ring C came out of the mold together. The ring C was easily sprung open and off the pulley and replaced in the mold ready for another casting. A touch with a scraper was all that was necessary to finish these castings in the lathe. Except at the gate these pulleys as they came from the mold ran within 0.002 of true.

SPECIFICATIONS FOR CAST IRON TO BE MACHINED.*

By H. E. Diller.

The machine shop which buys its castings generally takes what it gets —soft, medium, or hard—and usually has no redress unless the satisfaction of constant complaint and frequent change of supplier may be called this. General complaint seems to be the only remedy the machine shop which purchases its castings feels willing or able to make. Although many companies specify that out of each heat, one or more test bars shall be cast and tested, this is usually done to insure strength but not softness in the iron. Now there are a great multitude of castings on which considerable machine work is done and for which the strength of any soft iron is sufficient. For this class of castings, I would propose a specification which need cover only two points as to physical qualities and two points in the composition of the iron, and still insure a satisfactory casting.

First, that the castings be free from blow and shrink holes. This is the only qualification the majority of castings require to insure sufficient strength.

Second, that the surface of the casting be smooth and reasonably free from sand. This is a rather indefinite statement, but by establishing a standard of work between the individual buyer and producer, the specification can be made to mean something. Then the two specifications which I would suggest for the composition of the iron, are upper limits for the amount of combined carbon and the amount of sulphur.

It would also be advisable to have a standard method for determining the amount of combined carbon. By using the color method and having the same standard there is no reason why there should be any dispute as to whether the castings were coming up to requirements.

With such specifications, the foundry could be made to stand the extra expense of machining hard iron, and the foundry which could make regularly soft castings could command a higher price for them. When it is considered that the extra cost of machining a very hard

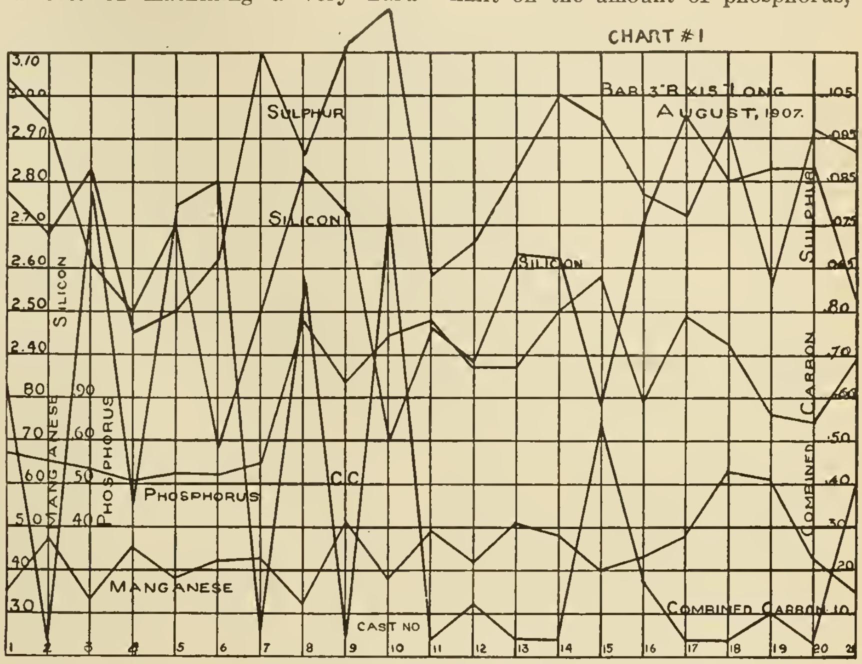


Chart No. 1.—Specifications for Cast Iron to be Machined.

casting sometimes equals the cost of the casting, it seems fair that the man who makes the hard casting should have some handicap in competing with the foundryman who turns out a uniform grade of iron.

As to the reliability of the combined carbon as an indicator of the hardness

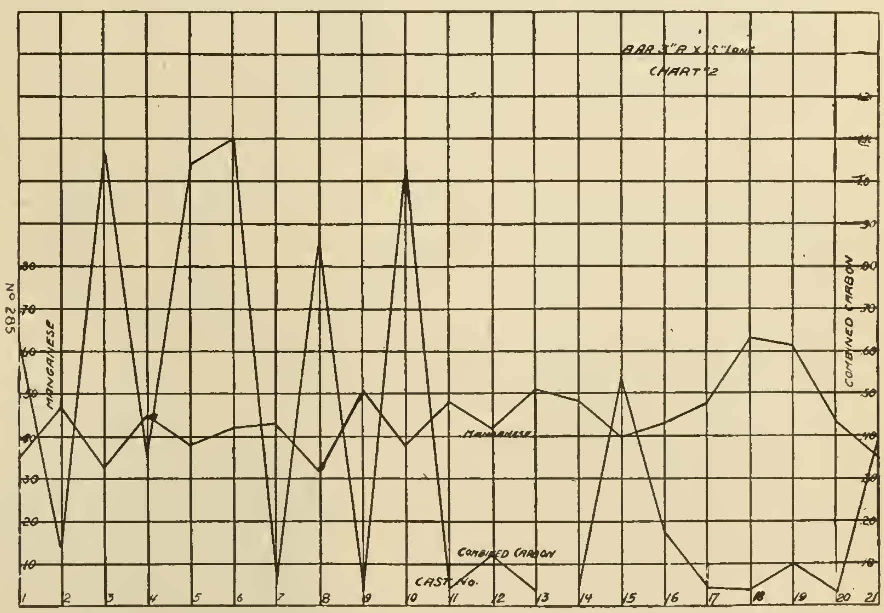


Chart No. 2.—Specifications for Cast Iron to be Machined.

of the iron, I was convinced by nearly a year of daily tests on a drill press and color carbon tests. These tests usually agreed closely, but when they did not, it was invariably due to some irregularity in the way the drill was sharpened or a little less power in the drill press.

It might be advisable to put an upper limit on the amount of phosphorus, but this limit would be so high as to be practically no limit—say one per cent.

There are so many variables entering into the making and composition of a casting that to me it seems the only and simplest way of specifying the quality of the iron for machining is to require it to be free from physical defects and to set a limit on the amount of combined carbon it may contain.

The accompanying chart gives a graphical illustration of the effect of manganese at the critical point on a

* Read before American Foundrymen's Association, Toronto, June, 1908.

fairly high silicon iron, cast in a heavy section to avoid the effects of the mold on the cooling of the iron.

Chart No. 2 gives only the manganese and carbon curves.

On chart No. 1 we see for the eighth cast, with the silicon nearly the highest of any cast—2.83 per cent.—and the sulphur medium—.091 per cent.—the combined carbon was high—.86 per cent.—while in the second cast in which the silicon and sulphur are about the same as in the eighth cast—2.94 per cent. and .073 per cent.—the combined carbon is only .04 per cent. Again, taking the ninth cast with sulphur much higher—.117 and silicon a little lower—2.73 per cent.—which should make a harder iron than that in the eighth cast, we find only .04 per cent. of carbon. Now let us note that in the hard iron, the manganese is .32 per cent. while in the soft iron it is .47 per cent. and .51 per cent. respectively.

From this chart, it would seem clear that silicon and sulphur contents will by no means guarantee a soft casting, even in a heavy section, if other conditions are not right; but that a determination of the combined carbon will tell very quickly if the iron is hard.

SOFTENS AND STRENGTHENS CAST IRON.

A silicon alloy for the purpose of strengthening and softening iron has been placed on the market. This alloy is dropped into the ladle just before the metal is tapped into it. The necessary quantity of alloy ranges from one pound in 500 pounds of iron, to one pound in 200 pounds of iron. The alloy melts and becomes diffused throughout the mass of molten metal, a characteristic reaction being immediately observed on the surface; this action will be noticed also on the risers after pouring.

For testing purposes, place three ounces of the powdered alloy in a hand ladle holding about twenty pounds of iron, then pour a set of test bars, 1"x1"x15", for transverse tests, also test pieces poured against a "chill plate," or better still, into an iron chill cup. In Fig. 1 is shown the construction of the chill cup. The strength is increased and drillings from sets of treated and untreated bars show the treated bar to be softer and chilled specimens show a reduction of chill, due to the conversion of combined carbon into graphitic form. Tests have been carried on in the Canadian Iron and Foundry Co. and Canada Car Co., Montreal, with the result that orders have been placed for the Outerbridge

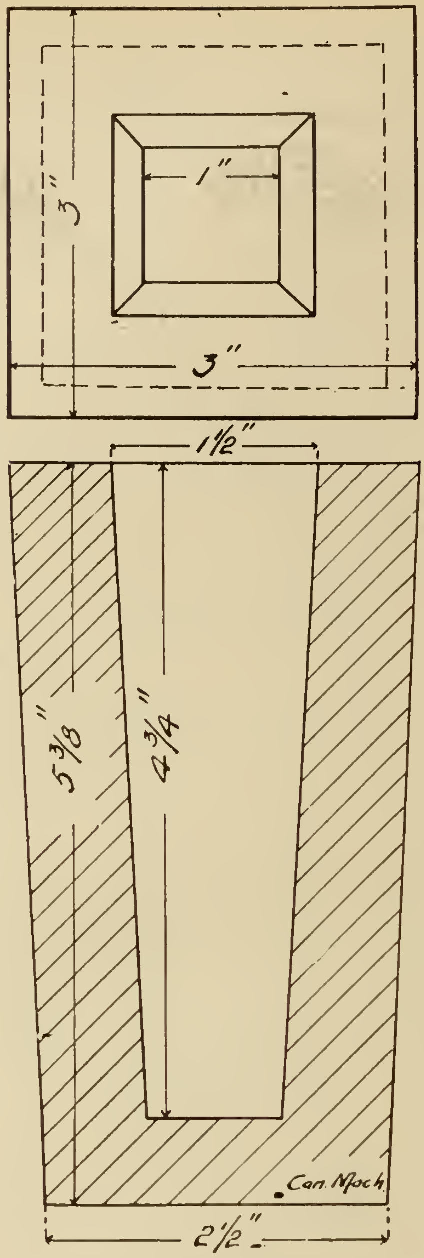


Fig. 1.—Section of Chill Cut.

Silicon Alloy. The treated specimens tested at the Canadian Iron and Foundry Co. showed a soft, gray iron with graphitic carbon, while the untreated bar showed a chilled surface.

At the Canada Car Co. the cooling was forced; and considering that instead of letting the iron stand until the following day, the test was made an hour after pouring, the result is remarkable. The test bars were allowed to cool until a man could handle them, and were then immersed in water. The untreated bar was mottled like chilled iron, while the treated bar showed an absence of more than the necessary amount of combined carbon. The testing machine showed that the addition of the alloy had increased the strength about thirty per cent.

The Test Bars.

Fig. 2 shows fractures of eight test bars of cast iron, all poured from the same hundred-pound ladle of rather hard cast iron. The four upper pieces are fractures of ordinary transverse test bars cast in green sand, 1"x1"x15", and were all perfectly grey iron. The four lower pieces were cast in chill cups, as shown in Fig. 1. The two pieces marked "A" were poured from untreated iron. The lower piece is entirely white iron and could not be drilled. "B" shows the fracture of two bars poured from the same iron after the addition of 0.3 per cent. silicon in the form of silicon alloy. The centre of the lower test piece, poured in the chill cup, is grey instead of white. In "C" bars there was 0.5 per cent. silicon added in the form of silicon alloy and the chill in the lower bar is still further reduced. Bars "D" show the fracture after the addition of 0.8 per cent. silicon. The chill in the bar cast in the chill cup is almost entirely absent. The bars treated with the alloy were much softer than the test bars from the untreated metal.

In addition, the treated bars showed more strength than the untreated bars, which is unusual, since it is commonly supposed that softening a metal decreases its strength. The increase in strength ranges from fifteen to twenty-five per cent., while in some cases this percentage is increased. Iron, low in silicon, has a high chilling property and sometimes castings, as a result, are found to be hard when they are machined. The Outerbridge process obviates this difficulty by softening the iron.

In 1886 Mr. Outerbridge discovered that softness was obtained by the ad-

Fig. 2.—Fractures of Test Bar

dition of ferro-manganese to the ladle of chilling iron, and this has been used in molten car-wheel iron with great success. Experiments were continued. Silicon, being the greatest softener of grey iron, was tried unsuccessfully because the melting point of pure silicon is higher than that of iron, and the specific gravity is only one-third of the molten metal, causing it to float on the ladle instead of diffusing through the iron.

Mr. Outerbridge has discovered that when silicon is alloyed in an electric furnace with iron in suitable proportions and granulated, it diffuses through the iron, changing combined carbon into the graphitic state, causing the iron to become softer.

This alloy is made by J. W. Paxson Co. and is sold in Canada by the Dominion Foundry Supply Co.

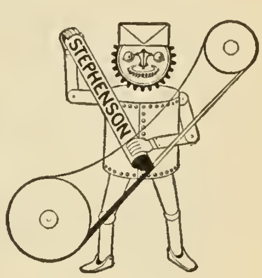
SOMETHING ABOUT TRADE MARKS

One of the chief ideas in advertising is to bring the firm's name before the class of people who are buyers of the article or product advertised, and to so impress it on these people that when this special article or product is thought of the firm also comes to memory. For instance, if a manufacturer makes small tools he should aim to advertise in such a way that his name and small tools are always closely associated. Then when a mechanic wants certain small tools, he thinks of this manufacturer, and if the tools are good, he will buy them. An important way of bringing this about is for the manufacturer to have a trade mark. This trade mark, to be most effective, should make the observer think of this firm and also think of the small tools. Take the trade mark of the L. S. Starrett Co., which is shown in an accompanying illustration. This is undoubtedly a very effective trade mark, embodying as it does the name and three representative lines of this firm's tools. This mark is used in all their advertising matter with highly satisfactory results. The company have just designed a large enameled steel mark, fifteen inches in diameter, for outside use.

Another most effective trade mark is that used by the Cleveland Twist Drill Co., consisting of a twist drill intersecting the word Cleveland, shown in accompanying illustration. This embodies the firm name and the article in an effective design. Both of these marks are very simple and yet very complete, two very desirable qdalities in a trade mark. They both perform in an effective manner the two chief functions of a trade mark, i.e., that of advertising in themselves the name of the firm and the line of product.

The two trade marks, "Gisholt" and "Norton," shown in accompanying illustrations, are two well known marks, well known because they have been used for some time and have always been used effectively. The Gisholt Machine Co. use their mark on every possible occasion, and with more than ordinary effectiveness and results. Borders of advertisements in mechanical papers are made up of this mark; inside covers of catalogues are designs of the trade mark; they never photograph a machine without including a sign of the same design as the trade mark.

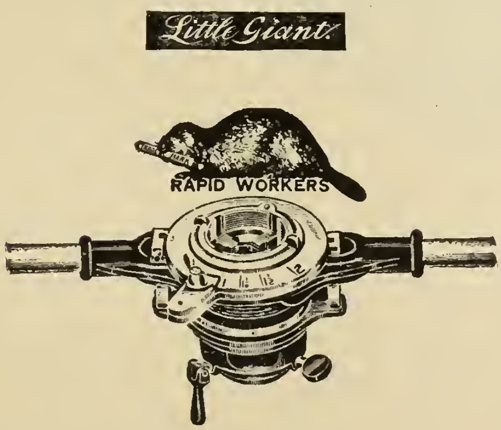
One never thinks of "Norton" without thinking of Norton grinders and vice versa. The Norton Co. sometimes use a cut of a grinding wheel labeled with their name and address, and this



has an advantage over their regular trade mark in showing the product as well as the name. The "Gisholt" mark is also lacking in this regard. In both these marks the name only is advertised.

The trade mark of Armstrong Bros. Tool Co. is very original and suggestive. In this case the name has lent itself very appropriately to an exceptionally good trade mark. "Armstrong tool holder" is suggested very forcibly by "a strong arm holding a tool—a hammer." This mark is very widely known and it is doubtful whethere there are any better.

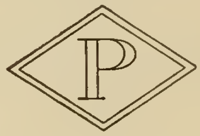
In the same class are the trade marks "Thor," of the Independent Pneumatic Tool Co., "Little Giant," of Wells Bros. and the Canadian Tap & Die Co., "Partine" of the Foundry Specialty



Co., and others. They are all good, especially "Little Giant" and "Thor," since on all taps and dies made by these two companies, this mark is stamped, and on all pneumatic tools made by the Independent Pneumatic Tool Co. "Thor" is stamped. These

marks are also used in all advertising and literature. But they are all lacking in the two very important features, the name and the product. But in cases where the name of the company does not lend itself well to a mark, such trade marks as these can be used to great advantage.

The trade marks of the Carborundum Co. are very striking ones. The one of the Indian head is their trade mark for specialties, such as oil stones, razor hones, etc. Adverse criticism of this trade mark might be made in that the Indian's head has no significance. Good features about it are the name and the location of factory. "Carborundum" and "hardest and sharpest" giving an idea of the specialties represented. Their other trade mark represents their wheels but undue importance is given to the location and the "S i C" is somewhat hard to interpret.



The little trade mark of the Hanna Engineering Works, while it is used to good effect in their literature, does not mean anything to an observer, and therefore cannot be of the same value as a trade mark as something which would designate the firm and their line of business. The mark represents Mr. Hanna's initials, "E. E. H."

The trade mark used by John Bertram & Sons, Miles-Bement-Pond, and Pratt & Whitney, is a very striking one, consisting, as it does, of the initials of the companies in white, with a black gear wheel as background. The gear wheel indicates the connection between the three companies, and the initials distinguish the companies.

The trade mark of the Stephenson Mfg. Co., Albany, N.Y., possesses all the essentials of a trade mark, and is exceptionally suggestive, showing at first glance, in a design which will be remembered, the product of the company, belt dressing.

The Borden-Canadian Co. have a very effective trade mark in the die stock surmounted by the beaver, as shown in accompanying illustration; but there is one feature lacking, the name of the company not being brought out. The beaver is very suggestive, but the "Borden" is not suggested.

Of a certainty, from the experience of the different companies using them, it is very advantageous to have a trade mark, the more appropriate the trade mark to the name of the company and their line of business, the better.

The trade mark of Allis-Chalmers Bullock takes the form of a standard name plate. The unique shape of the name plate makes it recognizable as belonging to this firm even at a distance when the name plate could not be read.

PERSONAL MENTION.

H. Saprey, of Syracuse Smelting Works, Montreal, is in England on business.

W. D. Robb, superintendent of motive power, G.T.R., Montreal, and Mrs. Robb, have returned from their tour of Europe.

James Powell, chief draftsman, G.T. R., Montreal; Chas. Manning of G.T.R. motive power department, and Mrs. Manning, are visiting in Scotland and England.

Mr. D. K. McLaren, President of D. K. McLaren, Ltd., and Mrs. McLaren, recently celebrated the fifty-third anniversary of their marriage. Mr. McLaren has been connected with the leather trade for the past sixty years and is still taking an active part in the leather belting business, in which he and his two sons are interested.

DEATH OF T. EDWARD LAMB.

It is with regret that we record the death of Mr. T. Edward Lamb, of the firm of Laurie & Lamb, Consulting & Contracting Engineers, Montreal. Mr. Lamb passed away at Caledonia Springs on the 13th inst., after a very brief illness. His death was quite unexpected, as on leaving Montreal a couple of days before he expressed his intention of returning to the office within a few days. Mr. Lamb was only 44 years of age, and was an engineer of exceptional ability. He was well known among mechanical engineers from one end of Canada to the other, as he was for many years superintendent and chief engineer of the original Laurie Engine Company, of Montreal, and many of those who are now holding important positions in mechanical engineering circles passed under his control as apprentices, or engineers. The loss is a severe one to his partner, Major W. H. Laurie, with whom Mr. Lamb has worked continuously since leaving school at the age of seventeen, when he entered the service of John Laurie & Bro. (afterwards formed into the Laurie Engine Co.) as apprentice draftsman, rising subsequently to the position of chief draftsman, shop foreman, superintendent, chief engineer, and for the last three years has been a partner with Mr. Laurie as consulting engineers. Such a life-long business connection is unusual in this country of quick and continual changes. Mr. Lamb was a prominent member of the Episcopal Church, being a church warden of St. Luke's Church, Montreal. He was a Free Mason and also a member of the Canadian Society of Civil Engineers. He leaves a wife and one daughter.

CANADIAN MACHINERY

and Manufacturing News

A monthly newspaper devoted to machinery and manufacturing interests mechanical and electrical trades, the foundry, technical progress, construction and improvement, and to all users of power developed from steam, gas, electricity, compressed air and water in Canada.

The MacLean Publishing Co., Limited

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SUBSCRIPTION RATE.

Canada, United States, $1.00, Great Britain, Australia and other colonies 4s. 6d., per year; other countries, $1.50. Advertising rates on request.

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Vol. IV. SEPTEMBER, 1908 No. 9.

LOOKING INTO TECHNICAL EDUCATION.

The Premier of Ontario will look into technical education matters when in Europe. It is a subject that will take a great deal of looking into.

Canada has been blessed by Nature with a great many things that if utilized will make it a great nation; but we are not always so quick to take advantage of our opportunities as we are to boast of their existence.

It is not because a country is rich in natural resources that it becomes great. Greatness depends more upon the character of its people than upon any other factor in nation building.

Technical education builds up character, by awakening the intelligence and stimulating the creative powers of the youth of the country who come under its influence. This is not a supposition. It is a fact attested by the experience of other nations and particularly Germany. The position that country has assumed during the last ten years among the industrial nations of the world is ascribed more to technical education than anything else.

In Canada we have made a beginning, but it is a very small beginning. Outside a board of trade or two and the Canadian Manufacturers' Association no body of men seem to be very enthusiastic over the subject. Even the educationalists, with few exceptions, are indifferent. Last year the inspector of technical education for Ontario, with a view to ascertaining what technical work was being done, sent a circular to the Public School inspectors in that Province. In his official report he says that not nearly 50 per cent. replied. This is certainly discouraging. And yet Ontario is doing more for technical education than any other Province.

Two or three years ago a movement was started to secure the co-operation of the Dominion Government. While supervision and care of education devolves upon the Provinces it is only proper that in a matter of such national importance as technical education assistance should be given by the Federal authorities. So far the most the Dominion Government appears to have done is to consider the advisability of appointing a commission to investigate and report upon this important subject. The matter has not yet gone beyond the consideration stage.

Politicians are usually slow to move in the direction of reform, but it is to be hoped that while abroad the Premier of Ontario will be so strongly inoculated with the technical education microbe that his enthusiasm will burn as a fever. In the meantime why should not another effort be made to innoculate the Dominion Government?

TALK FROM EDITOR TO READER.

What is good in this issue? We hope our readers will appreciate our efforts. But it would help us very materially to have our readers tell us what they do not like, as well as what they do like. If there is anything wrong—any incorrect statements—we ask you to write us. If you can throw light on a point which you think is not clear, or which you think is not correct, we will gladly pay for your contribution. If you can comment to advantage on anything that appears, don't hesitate. We will gladly receive it, print it, and pay for it.

*

The article on the vertical boring mill is very complete. It is written by a man who has been in close touch with the development of this interesting machine tool right from the start. Being well written and well illustrated, it should prove good and interesting reading.

*

Handling men is an art. Some have a gift for it—are born to it. Others have to make a close study of it in order to make any sort of a fist of it. The illustrated article on this subject should prove entertaining reading matter for all, and very instructive for those who have men in their charge. The article is written from data collected by the writer from actual experience.

*

This issue contains another article by John Edgar, on milling machine practice. This article tells how an ordinary milling machine was made to serve as a thread milling machine by the addition of a special device. John Edgar usually writes good stuff, and this is no exception.

*

The American Foundrymen's Association have had a committee at work for several years developing a cost system for foundries which would be standard. At the convention in Toronto this committee submitted a report including a chart. This report and chart are printed in this issue. Every manufacturer who has a foundry should investigate this.

*

What machine shop has not been pestered with hard castings—castings that the tool would scarcely touch? An article in this issue gives specifications for cast iron to be machined, which will probably prove instructive to the foundry superintendent or foreman.

INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News.

Machine Shop and Foundry News.

The new I.C.R. machine shops at Moncton are nearing completion.

The Bigley Mfg. Co., Toronto, will erect a $15,000 foundry and machine shop.

The G.T.R. propose erecting a $150,000 car-shops and repairing plant at Barrie.

The Western Bridge & Equipment Co., Chatham, is thinking of locating at Vancouver.

The C.P.R., it is rumored, will take over the plant of the Algoma Steel Co. at Sault Ste. Marie.

Rapid construction work is being done on the new Victoria Machinery Depot's buildings at Victoria.

The new $15,000 car shops built for the B. C. Electric Railway at New Westminster have been completed.

About 70 hands in the car wheel foundry at the Angus C.P.R. shops have joined the striking mechanics.

The Brabant's Brass Works, of Detroit, are considering the establishment of a branch in Windsor, Ont.

The Waterloo Machinery Co. contemplate starting work on their building at Portage la Prairie this fall.

The Lennox Furnace Co., Marshalltown, Iowa, will establish a branch in Canada, either at Winnipeg or Fort William.

The reorganization of the Dominion Iron & Steel Co. is planned, and President Plummer has gone to Europe to confer with capitalists there.

The Dominion Bridge Company have been awarded the contract for the erection of all the structural steel on the Fort Garry depot, Winnipeg.

J. T. Shadforth, Victoria, is authority for the statement that large steel works employing 1,000 men, will be established this year on Vancouver Island.

A proposition for the establishment of car erection shops at Fort William is now before the city council. The proposed plant will cover about forty acres.

Iron ore running 60 per cent. to the ton has been found in the Laurentides, within 100 miles of Montreal, and large steel works at the latter place are hinted at.

A by-law will be submitted to the Kincardine, Ont., ratepayers for the purpose of authorizing a loan of $25,000 to the Hunter Bridge & Boiler Company, for the extension of their works.

The erection of the Marine and General Engineering Co.'s foundry at Sydney C.B., is being pushed. The forge department is now working, and machinery is being placed in the machine shop.

Part of the plant of the Nova Scotia Steel & Coal Co., at Sydney, C.B., has resumed operations. The coke ovens and blast furnaces opened on July 20. The latter will manufacture foundry iron.

The Hamilton Steel & Iron Company is making preparations for the erection of a new office building for their east end plant. It is expected that the building will cost in the neighborhood of $10,000, if not more.

Enterprise Foundry, Sackville, N.B., was struck by lightning and completely destroyed, with a heavy loss. A large stock of stoves, ranges and hot air furnaces was in the warehouse for the fall trade and these were all destroyed.

The James Smart Mfg. Co., Brockville, Ont., is building a new machine shop. It will be a three-storey, brick, mill construction, 150 by 60 feet building. This company intend to later build a 60 by 40-foot addition to their tool department and forging shop.

A destructive fire at Sackville, N.B., destroyed the Enterprise Foundry plant, owned by Emerson & Fisher, of St. John. The plant consisted of a large warehouse and office building, mill room, pattern shop, molding shop, fitting shop, new power house and foundry. All were burned, together with all the patterns and other valuable equipment. With the exception of the Fawcett Foundry, it was the largest industry in Sackville. It was acquired by Emerson & Fisher about twenty years ago, being operated previous to that time by A. Cogswell & Co., as the Colonial Foundry. The fire came at a particularly bad time, as the company had their stock all made up for the fall trade, and the loss will be very heavy, one estimate placing it at $100,000, while the insurance is but $52,000. The foundry was running on full time, and between ninety and one hundred men were employed. St. John, N.B., is trying to get the Enterprise Foundry to locate at that place; while Sackville is putting up a fight to retain the concern.

News of Electrical Undertakings.

Hamiota, Man., will build and instal a municipal telephone system.

Wingham will spend $7,000 on repairing its electric light power house.

The Rural Telephone Company, Palmerston, Ont., has commenced construction.

The Toronto Electric Light Co. is extending its underground service in that city.

A by-law to raise $15,000 for an electric light plant has been carried at Boissevain, Man.

Tenders will be received until September 15, for Winnipeg's electric lighting plant and carbons.

At Morden, Man., a by-law will be submitted to the ratepayers to raise $10,000 for electric light purposes.

The ratepayers of Killarney, Man., have passed a by-law to grant a $2,000 bonus to an electric light company.

At the end of the present year the contract between the Montreal Heat & Power Co. and that city will expire.

Work on the construction af a local and rural telephone system is to be commenced at once at Caledon, Ont.

The Canadian Westinghouse Co. has finished the instalation of an electric plant at the new Port Colborne elevator.

The Wellesley & Mornington Telephone Association, Crosshill, Ont., contemplate considerable additional construction work.

Fernie city council is negotiating with the Crow's Nest Pass Coal Co. to take over its electric light and telephone franchises.

The New Brunswick Telephone Company, are considering the extension of their line from Prince William to Harvey Station, N.B.

The recently organized Wauchope, Sask., People's Telephone Company expect to commence work on the construction of their system at once.

The construction of the telephone system is to be undertaken at once at Dunedin, Ont., by the recently incorporated Noisy River Telephone Company.

Coaticook, Que., has agreed to buy additional power for light purposes and 18 feet of head of power has been purchased for $2,000 from the Penman Co.

At a recent meeting of the directors of the Temiskaming Telephone Company, Haileybury, Ont., it was decided to construct a line to Silver Centre.

A franchise for the instalation of a telephone system at Maple Creek, Sask., has been granted to G. W. Quick, who will start work on the system at once.

G. C. Hinton, of the Hinton Electric Company, Vancouver, has been at Vernon in connection with the instalation of an electric fire alarm system there.

The Ottawa city council will submit a by-law for the purchase of the electric company's plant for $74,000. Extensions and removal of the plant will cost $100,000.

Kenneth L. Aitken was appointed engineer to take charge of the construction and operation of Toronto's electrical distribution plant at a salary of $3,600 a year.

A rural telephone company is being organized by the farmers north of Canora, Sask. Work on the construction of the lines is to be commenced at an early date.

The Yellow Grass, Sask., Telephone Company, which was recently organized, has been incorporated, and construction work is to be commenced at an early date.

The Kootenay Development Company is erecting a pole-line to electrify the property of the Silver King mine and and the Hall mines smelter, upon which they have taken a lease.

The Lumsden, Sask., Radial Telephone Company, which was organized a short time ago, have filed articles of incorporation, and expect shortly to instal a local system at that town.

Lethbridge, Alta., city council has come to terms for the purchase of the plant of the Lethbridge Electric Co., and a by-law to raise $73,749 for the purpose will be submitted to the ratepayers.

The Bell Telephone Company is expected shortly to apply for a renewal of their five-year franchise at Woodstock, Ont. It is believed that the company will undertake to instal a central energy system.

Montreal city council has passed the ordinance granting a franchise to the Canadian Light & Power Company. The by-law requires the company to supply 5,000 h.p. by 1910, and 20,000 h.p. by 1915.

Voting took place at Killarney on the by-law to grant a franchise and a bonus of $2,000 to George Collison, of Estevan, to establish an electric light plant. The by-law was carried by 107 for and 17 against.

Streetsville, Ont., recently installed a municipal electric lighting plant at a cost of $26,000, and is now supplying electric current at six cents per 1000. This is the lowest rate given by any plant in Ontario.

Merritton town council has decided to municipalize their electric light plant, and passed a resolution requesting the Hydro-Electric Commission to submit a price for electric power delivered at Merritton for distribution.

Power to supply electricity for the lighting of Chilliwack will be generated at the Chilliwack Manufacturing Company's mill at Sardis until such time as the B. C. Electric Railway Company has its lines extended to that city.

The Lumsden, Sask., Radial Telephone Company is to instal a service in the town of Lumsden to connect with the Government's long-distance lines. The rates will be $2 per month for business connections, and $1.50 for residences.

The Western Counties Electric Co. offer to supply power to Brantford at ten per cent. less than the Hydro-Electric Commission. The Cataract Power Co. also offers that city to make the same rate as the Western Counties Company.

Both the Stark Electric Co. and the Falls Power Co. have lost their deposits because of inability to fulfil their contracts with St. Catharines. It is rumored that a third light and power company will combine with the Hamilton Cataract people to light St. Catharines' streets.

If satisfactory arrangements can be made between the city of Vancouver and the B. C. Electric Co. in regard to that city not competing in the power business, the company will develop the Jordan River water power and sell the electric energy for manufacturing purposes.

Considerable extensions are planned by the Charlevoix & Saguenay Telephone Company. Lines are soon to be built to St. Joachim, St. Agnes, Tadousac and other neighboring municipalities in Quebec Province. Connections are also to be established with the Chicoutimi Telephone Company at St. Urban, near Baie St. Paul.

The Saskatchewan Provincial Government has announced its intention of building the following long distance telephone lines; From Lumsden to Prince Albert, connecting with the towns along the C.N.R.; to serve towns and villages along the Arcola and Estevan branches of the C.P.R.: branch lines east and west from Warman to the boundaries of the province and following the C.N.R.: branch lines parallelling the Wolseley-Reston, Pheasant Hills, Weighburn, and Stoughton railways; from Prince Albert, connecting Kinistino, Melfort, Star City, Tisdale and other towns and villages; crossing the province from north to south and connecting Alameda, Carlyle, Wapella, Yorktown and Saltcoats. Branch lines will also be laid out to follow the railway branches.

Saw and Planing Mill News.

A. Todd, Walkerton, will erect a sawmill at Guelph.

A. G. Chew's sawmill at Tannersville, Ont., has been burned.

C. J. Moore, Victoria, will build a sawmill at Prince Rupert.

M. W. White & Co. will erect a planing mill at Beaver Cove, N.S.

The St. Lawrence Lumber Co. will build a sawmill at Dalhousie, N.B.

The Adolphe lumber mill at Baynes' Lake, Elko, B.C., was destroyed by fire.

Devey & Owen's sawmill at New Westminster, B.C., has been destroyed by fire.

McAllister's stave and heading factory at Hawkesville, Ont., has been burned down.

L. A. Brien & Co., Montreal, will carry on business as sash and door manufacturers.

Taylor & Jamieson will rebuild their sawmill at Scotstown, Que., recently burned down.

The planing branch of the Selkirk, Ont., saw and planing mills is just about to start up.

H. Crate's sawmill at Lombardy, Ont., has been burned, with a good deal of machinery.

William Roberts & Sons' grist and shingle mill, Nanessa, Ont., was destroyed by fire. Loss $15,000.

The Stanley Railway and Manufacturing Co. will build a woodworking factory at Ryan's Brook, N.B.

A sawmill will be erected at Oromocto, N.B., this summer. S. G. Fitzpatrick, St. John, N. B., is interested.

Geo. Tennant has bought the Bracebridge, Ont., furniture factory and will convert it into a woodworking plant.

G. A. Grier & Son, Montreal, are fitting up their large factory building on Notre Dame St. West, as a planing mill.

Beckler & Company's sawmill at Sombra, Ont., was burned to the ground on July 13. Loss, $6,000; partly covered by insurance.

W. H. Phillips, of Seattle, and E. F. Mitchell, of Vancouver, are erecting a sawmill near Aberdeen, B.C., with a capacity of 50,000 feet.

The Adolphe Lumber Mill at Baynes' Lake, south of Elko, B.C., was completely destroyed by fire a short time ago. All the lumber was saved.

Wm. Dauphinee's sawmill at St. Margaret.s Bay, Nova Scotia, has been burned down. Only the engine and boiler and some lumber stock were saved.

The Dokis Indian Reserve, situate near French River and Lake Nipissing, and containing, it is said, 100,000,000 feet of lumber, was sold at auction for $871,000.

W. Routlee has erected a tie mill in South Vancouver, B.C., which is operated by electricity, obtained from the transmission lines of the British Columbia Railway Co.

The Wm. Smith Company, manufacturers of church and lodge furniture and mantels, etc., at Chesley, Ont., have been granted by that municipality free water and exemption from taxation.

C. W. Gibb's planing mill in Winnipeg was badly damaged by fire last month to the extent of about $4,000. A good deal of valuable machinery was injured, but the boiler and engine escaped.

The Canadian Steel Specialty Co., Gravenhurst, Ont., who now make a specialty of bent steel furniture, counter stools, etc., contemplate going into the business of making wooden chairs as well.

E. J. Skeans, of Vancouver, has completed arrangements for the erection of a large sawmill on the Alberni canal. The mill will have an initial capacity of 75,000 feet per day. The estimated cost is $75,000.

A sawmill is being erected on the Skeena river four miles from Aberdeen, B.C., by W. H. Phelps, of Seattle, and E. F. Mitchell, of Vancouver. It will cost $35,000, and will have a daily capacity of 50,000 feet.

A large rossing mill will probably be erected at Cornwall, Ont., by the Santa Clare Lumber Company, who have taken an option on a site of six acres of land. Therris J. Meigs, New York City, is general manager. Employment for 150 men will be provided.

R. B. Bissett's sash and door factory, Strathcona, Alta., was destroyed by fire. The building is a complete ruin. Mr. Bissett estimates his loss at $25,000, the building and stock being worth $11,000 and the machinery $14,000. He had no insurance on it. Some ten men were employed.

The Brooks-Scanlon Lumber Company are postponing for a while their project for erecting two large sawmills in British Columbia, one at Harrison river and one on the coast. A. S. Brooks, a member of the company, expresses his confidence in a marked improvement in general conditions after the presidential elections. A deal for the purchase of forty timber berths is pending.

Chicago capitalists have secured an option on a tract of timber limits comprising 198,000 acres in East Kootenay, and representing a portion of the land grant to the Nelson and Fort Sheppard Railway, a link in the Great Northern system. This large area contains, it is estimated, about eight billion feet of timber. The deal is being negotiated by John McEwan, of Vancouver, and involves the payment of $750,000.

Railroad News.

The C.P.R. will build a line from Calgary to Lethbridge.

The Algoma Central is building a five-mile spur to the Superior mine.

The C.P.R. are erecting a bridge across Highwood river, at Menton, Man.

The C.P.R. propose to build all steel bridges in Western Ontario in future.

The Moose Jaw-Lacombe section of the C. P. R. will be completed this fall.

An electric railway is proposed to be built between Dunnville and Beamsville, Ont.

The C.N.R. between Winnipeg and Portage la Prairie is being relaid with 80-pound steel.

The C.P.R. will likely spend about $125,000 in improving their terminals at Hull, Que.

The Moncton and Butouche Railway is building a new bridge over the Butouche River.

The Matane and Gaspe Railway will build 35 miles of line from St. Flavie to Matane, Que.

The Ha Ha Bay Railway will construct a line from Jonquieres and Bagotville, Que., 20 miles.

The White Pass Railway is building a 12-mile branch from Whitehorse, B.C., to some nearby copper properties.

Thirty thousand tons of steel rails will be taken out west for extensions on the C. P. R. and C.N.R. this summer.

Construction on the second section of the British Columbia Electric Railway from Cloverdale to Abbotsford will be started soon.

D. A. Rankin, Spokane; Freberg & Stone, and Boie Bros., & Moram, Idaho, have subcontracts on the G.T.P. in British Columbia.

The Transcontinental Railway Commission invites tenders for 44,447 tons of steel rails, and the necessary fastenings. Tenders are to be in on September 1.

It is likely that the Canadian White Co., of Montreal, will get the contract to build the mountain section of the G.T.P. between Edmonton and Prince Rupert.

The C.P.R. have purchased the right-of-way for a spur line to the Royal collieries mine from the main line east of Lethbridge. The spur will be built immediately.

The Canadian Northern Ontario Railway propose commencing construction of their line to Orillia right away, so that cars will be running into that town before winter.

Once again the story is revived that the Hamilton Radial Railway will purchase the property at the southwest corner of Terauley and Albert Streets for a Toronto terminal.

The Canadian Northern and Trans-Canada Railways are surveying lines from Roberval, in the Lake St. John region to the new mining district, 190 miles northwest of that place.

The Electric Railway Commission, Port Arthur, Ont., will proceed with the double-tracking of the railway line between Current River Park and the southern boundary of the city.

Dussault & Powers, Levis, Que., have been awarded the contract for the fifteen-mile extension of the Quebec Central Railway from St. George, Beauce to St. Justice, at an estimated cost of $300,000.

John Haggerty & Co., Victoria, have the construction contract of the first ten miles of the Hudson Bay Pacific Railway. This new road will be 1,450 miles long from a point on Hudson's Bay to a port on the Pacific.

The Dominion Engineering Co., Toronto, expect soon to make a start on the construction of the Central Railway, which will run from Midland, Ont., to Montreal, a distance of 345 miles. Bonds to the extent of nearly $12,000,000 have been underwritten in England.

The Dominion Government have placed $400,000 in the estimates for the diversion of the Intercolonial from Georges River to Sydney Mines by way of Little Bras d'Or; from Sydney Mines to North Sydney by the existing line; and from North Sydney to Leitche's Creek by way of Upper North Sydney.

The Grand Trunk Railway Company have completed a deal by which they have secured the property at London on which the Hobbs Plate Glass Works stood before the recent fire. The yards at London are the narrowest on the Grand Trunk system, and this purchase will enable the company to considerably widen it.

It is understood that the Central Railway Co., which has a charter for the construction of a railway from Montreal to Midland has succeeded in placing $11,000,000 worth of bonds in London, and will begin construction shortly. It is said the contract to build the road has already been placed with the Dominion Engineering Company, Toronto.

The Grand Trunk Railway System has spent within the past few years not less than $15,000,000 in double-tracking the main line, thus giving it the longest stretch of double track under one management in the world. In addition to this the company has spent other millions in stations, shops, and other improvements, thus increasing the carrying capacity of the line.

Since the Ontario Government has taken over the extension of the northern part of the T. & N. O., the work on the road has been most progressive. Driftwood City marks the end of the steel, "Cochrane," the future junction of the T. & N.O. and the Transcontinental, is 42 miles north of the Chutes, and it is calculated that the road will be laid to there by the end of the season.

It is announced that the Grand Trunk Railway and the T. & N.O. Railways have signed an agreement by which these railroads will occupy their own station and freight sheds at North Bay, entering the town on their own right-of-way from Nipissing Junction, with four passenger tracks leading to the new station. It is intended that the new building will be alongside the present union station.

The Grand Trunk Pacific is now assembling the first twenty passenger cars for use on the new line west of Winnipeg. So far as freight equipment is concerned the G.T.P. will have 2,000 box cars in the west for use on the section of the line that will take part in the handling of this season's crop. Altogether it has 5,500 built, but the majority of these will during the present autumn be employed by the Grand Trunk in the movement of grain from lower lake terminals eastward.

General Manufacturing News.

Fire has destroyed the steam plant of the Campbellton Steam Laundry.

Manganese has been discovered in Beresford parish, Gloucester County, N.S.

The Martin & Stanworth Co.'s stone-cutting plant at Port Arthur is being enlarged.

The W. R. Hearst Newspaper Syndicate will erect a large pulp mill at Norman, Ont.

Improvements are contemplated by the reorganized American Asbestos Co., Black Lake, Que.

The Eureka Refrigerator Co. have purchased a site in Toronto, on which they will erect a factory.

Work is being rushed on Midland's $3,000,000 grain elevator. At present 700 men are employed.

E. E. Hall, Minneapolis, Minn., will build from five to eight elevators in Saskatchewan this year.

The Carbolinium Paving Co., Vancouver, is removing its plant from that city to New Westminster.

The Peterboro Cereal Co. will erect a new and larger building to replace the one recently destroyed by fire.

Mr. Webb, an American inventor, is trying to form a company at Orillia, Ont., to manufacture a patent curtain pole.

The Whitman-Barnes Mfg. Co. has accepted St. Catharines' offer of ten years' tax exemption and will rebuild there.

The Standard Implement Co. is putting the finishing touches to its factory at Port Stanley, preparatory to opening.

Peer & Wideman have commenced operations in their factory at Guelph for the manufacture of the Peerless gas generator.

The Arden, Man., flour mills and elevator were burned to the ground recently, together with six thousand bushels of wheat.

The Shipway Iron, Wire and Bell Co., Toronto, desire to locate in the Fielding Chemical and Distilling Co.'s building at Weston.

The Brantford Emery Wheel Co. is a new concern starting in Brantford. A new plant is being erected and new machinery installed.

The Garry-Brook Co., manufacturers of malleable iron goods, will locate at Pembroke. Fifty hands will be employed at commencement.

Eugene DeKleitz, Buffalo, N.Y., is looking over Berlin and Guelph preparatory to building a Canadian branch piano-making factory.

A mineralized belt containing copper, silver and nickel, has been found at a depth of 60

feet at St. Alexis, N.B., and is being developed.

The Vulcan Portland Cement Co. are establishing works at Longue Pointe, Que., which are said to be one of the largest in the Dominion.

F. W. Moris, Victoria, will commence on an extensive scale the manufacture of white lead at that city, building a $20,000 plant for the purpose.

A new excursion steamer will be built at Belleville during the winter, so great has been the demand on the regular boats plying in and out of that port.

The McKinley-Darragh Co., New Liskeard, are enlarging their concentrating mill. The Coniagas too, is extending and the Buffalo concentrator is putting in a cyanide plant.

The contract for the addition to the Winnipeg Carnegie library has been awarded to J. H. Tremblev at $26,951. Eight tenders were received, the highest being $33,845.

The Toronto Commissioner of Industries is looking for a site for a United States concern which desires to establish works in Canada. The new firm would employ 500 men.

James A. Anderson, of Bonnybridge, Scotland, representing I. G. Stein & Co., has succeeded in placing a large order with the Dominion Iron & Steel Co., Sydney, C.B.

The National Fire Proofing Co., of Pennsylvania, has obtained a license to manufacture brick and fireproofing material in Ontario. F. E. Brown, Toronto, is the company's [illegible].

Eastern capitalists have leased for three years Davison & Co.'s sash and door factory at Strathcona, Alta., and will manufacture on an extensive scale furniture, mattresses and caskets.

The premises of the Kerr Milling Company, Dundas, Ont., were completely gutted by fire recently. The loss will be heavy. There is about $17,000 insurance on the building, plant and stock.

The Grey & Bruce Cement Co., Owen Sound, will close down the plant for several weeks owing to the present unsatisfactory state of the market, the supply being far in excess of the demand.

On July 30, J. & D. A. Harquail commenced to rebuild their woodworking factory, recently burned in Campbellton, N.B. The town refused exemption from taxation, but the company will remain.

The Improved Paper & Machine Co., Nashua, N.H., manufacturers of paper and pulp-making machinery will erect a plant at Sherbrooke, Que., under the name of the Sherbrooke Machine Co.

James A. Cline, manufacturer of upholstered furniture at Stratford, has joined forces with Mortlock Bros., Guelph, and is removing his plant to that city. The new firm will be known as Mortlock & Cline.

The Pratt & Lambert Varnish Works, Buffalo, N.Y., are looking at a site in Bridgeburg on which to locate a Canadian branch factory. Niagara Falls, too, is trying to induce the concern to locate there.

A test run was made in the Lehigh Portland Cement Company's works, which have been in course of construction at Point Anne, near Belleville, during the past two years, and every thing went satisfactorily.

W. F. Jennison, C.E., of Sydney, N.S., reports to the Ottawa Government that the gypsum deposits of New Brunswick and Nova Scotia probably exceed anything known to the world, both in quantity and quality.

Prospects are good for the beginning of operations at the Leason copper mines at Stony Lake, Ont. Some rich ore has been found and a building will be erected over the whole plant. Day and night gangs will be employed.

The mill recently established at Madoc Village, Ont., to grind the product of the Moira Lake talc mine for the Canadian market is full of orders for some time to come. The first shipments will be made in a few days.

The latest rumor regarding the various plants at Sault Ste. Marie is that the Mackenzie & Mann interests will take over the Algoma Central Railway and the U. S. Steel Corporation will control the rail mill and blast furnaces.

St. Martin's, N.S., is looking forward to marked activity next year in the development of plaster quarries, when the railway will be extended to the quarries on the shore. An immense body of plaster has been located and acquired by New York capitalists.

Among recent fires were the premises of the Crown Hat Co., Galt, Ont., loss $7,000; the sawmill of George Brumwell, Lindsay Ont., loss $7,000; sawmill of Beckler & Co. Sombra, Ont., loss $6,000; the factory of Montreal Carriage Works, Montreal, Que., loss $15,000.

The Peterboro Lubricator Mfg. Co. has acquired for its plant the present furniture factory in East City, managed and owned by Thomas W. Oke. The latter has found that the present premises are inadequate and is erecting a new building. The Lubricator Mfg. Co. will manufacture grease cups.

It has been decided by the Kingston city council to replace the old dome on the city buildings with one of steel framework and metal sheeting. Plans and specifications will be prepared at once, and tenders will be called for the work. There is a chance of the dome being completed by the end of the year.

The big Carrier, Laine & Co. factory at Levis, P.Q., which has been closed for the last few years, has been purchased by the Bank of Montreal. It has a frontage of 700 feet on the St. Lawrence and is in close proximity to the I.C.R. It is expected that the Dominion Government will use it as a machine repair works for the Marine Department.

C. A. McKinnon, well known on the coast because of his connection with the logging business, is now president of the British Columbia Pressed Brick Company, which has established a factory at Steveston, on the Fraser River. The product is sand-lime bricks, the Komnick system being used, which is well-known through out Ontario. The plant cost $60,000.

The output of the D.I. & S. Company, at Sydney, C.B., during the month of July was highly satisfactory, notwithstanding the fact that the plant was closed down for about a week at the opening of the month. Over 22,000 tons of steel were turned out, all of which was converted into rails, wire rods, billets, etc., to fill orders. The total shipments were 23,332 tons.

Among the firms who will have exhibits at the St. John Exhibition, Sept. 12 to 20, are the following: R. H. Smith & Co., St. Catharines, Ont., saw manufacturers; Darling Bros. & Co., Montreal, machinery and engineering; Canadian Fairbanks Co.; Dunlop Tire & Rubber Co., Toronto; Dominion Carriage Co., Montreal; Canadian Rubber Co.; James Pender & Co., St. John, nail manufacturers, and T. S. Simms & Co., St. John, manufacturers of brushes.

Arrangements have now been completed by the Ouiatchouan Pulp Company to instal machinery for the manufacture of paper at their plant at Ouiatchouan Falls, Quebec. The Metabetchouan Pulp Company at St. Andre, Que., also intend to instal papermaking machines. The Jonquieres Pulp Company, Chicoutimi, Quebec, have decided upon expansion, which will embrace the manufacture of paper in the near future. Hitherto these companies only manufactured wood pulp, of which the greater portion was exported.

An important addition to Fort William's industries is just ready to start operations, the Whalen-Bowman machine and repair [illegible] which are located on what is known as Island No. 2, at the intersection of the Kaministikwia and McKellar Rivers. The new plant has been laid out with the idea of catering to the marine trade so that vessels need not be compelled to run to Duluth, or to some port on the lower lakes, for even extensive repairs. The company intends ultimately to build a dry dock, where the largest of the Canadian lake fleet may be docked.

Structural Steel Construction News.

A bridge to cost $3,000 will be built at Lulu Island, New Westminster.

The bridge near Dumfries, Ont., recently burnt, will be reconstructed at once.

St. John, N.B., wants a bridge across the harbor. Its construction would cost $500,000.

The Hope slough bridge, Chilliwack, B.C., will be pulled down and probably a new one built.

The Dominion Bridge Co. has the contract for the $4,500 bridge across the Magog river at St Johns, Que.

The County of Simcoe, in conjunction with the Ontario Government, will build a bridge at Bradford, Ont.

The North Vancouver, B.C., district council will erect a steel truss bridge, 140 feet span, over Seymour river.

The Saskatchewan Provincial Government will build four steel bridges across the creek to the south of Prince Albert.

The Government bridge across the Thompson river at Savona, B.C., collapsed. It will take $10,000 to repair the structure.

The Morris, Ont., township council will erect a new steel bridge. It will have cement abutments and a steel superstructure.

The contract for a bridge over the Back river, at Brown, Ont., has been awarded to the Ontario Bridge Company at $3,350.

The Dominion Bridge Company have commenced work on the Redwood Avenue bridge, Winnipeg, and will rush this work forward to completion.

The Western Bridge & Equipment Co., Chatham, has received contracts for a 112-foot span iron bridge at Guelph, and for stretching 209 feet at Elora.

The contract for the bridge across the Holland river near Bradford, Ont., has been awarded to the Dickson Bridge Company, Campbellford, at $7,000.

McNeil & Company New Glasgow, have obtained the contract for steel superstructure of three new spans of the Fredericton highway bridge at about $29,000.

Owen Sound ratepayers have approved of the construction of the new bridge across the river at Union Street, and work on it will be commenced in the near future.

Brantford's city engineer has been instructed to prepare plans and specifications for the erection of a steel bridge with concrete abutments, to replace the Alfred Street bridge.

The construction of a steel bridge over Garth Street, Hamilton, Ont., is under consideration, and the cost of constructing a 38-ft. bridge with a 5-ft. walk has been estimated at $24,000.

Amos Train, Kinmount, superintendent of bridges for the Ontario Government is with William Kennedy, provincial superintendent, at Burnt River, near Lindsay, commencing work on the new iron bridge to be erected over that river.

At a meeting of the Brantford, Ont., Board of Works, the city engineer was instructed to prepare plans and specifications for the erection of a steel bridge, to replace the Alfred Street bridge.

Bridge building in Middlesex County, Ont., is being carried on in record style. The Guest bridge across the Thames will cost $11,000; the Wiley bridge, $14,000; the Alvinston bridge, $1,300, and a number of other bridges are being repaired.

Tenders are being invited by the Peterboro County Council for the construction of the steel superstructures for the North River bridge in Belmont and the Victoria Street bridge in Norwood.

Huntingdon, Que., council has awarded the tender for a new white pine tank to the Canadian Fairbanks Co., Montreal. The tank will have a capacity of 50,000 gallons, and will be erected on a steel tower fifty feet high.

The contract for the new bridge over the the Prince Albert to Edmonton extension of the North Saskatchewan river, at Prince Albert, for Canadian Northern Railway, has been awarded to the Hamilton Bridge Works Company, Ltd., Hamilton Ont.

The York county commissioners have awarded the contract for two steel bridges. The one is over the Holland river, near Bradford and the other across the stream at Brownhill. The Dickson Bridge Company of Campbellford, were awarded the contract for the Holland river bridge at $7,000, and the Ontario Bridge Company the other at $3,350.

Tenders are being called for by the Quebec Provincial Government for bridges at St Jacques, Madawaska County and Havelock, Kings County. Hon. John Morrissey, Commissioner of Public Works, is now making an inspection of the bridges and wharves in Kings County and he reports that many improvements and repairs will be needed.

The contract for the construction of the new steel and concrete dam above the Chaudiere Falls was awarded to Quinlan & Robertson, of Montreal, by the power interests on the Ottawa and Hull sides of the river, who are sharing in the cost. The amount of the contract is in the vicinity of $250,000, and the work is to include the removal of the old dam as well as the construction of the new.

The Grey county council has awarded contracts for three bridges. The contract for the bridge over the Pottawatomie at Wright's Mill goes to Louis Looby, Dublin, Ont.; contract price $2,480. John Walker, Southampton, will build the bridge over the Spey one mile north of Chatsworth for $687.50, and Walker Bros., the contract for the third bridge, over Camp Creek, near Durham, for $657.50.

Waterworks and Sewerage News.

New sewers are being constructed in Perth Ont.

A sewerage system is suggested for Kincardine Ont.

A number of water pipes are being laid in Saskatoon.

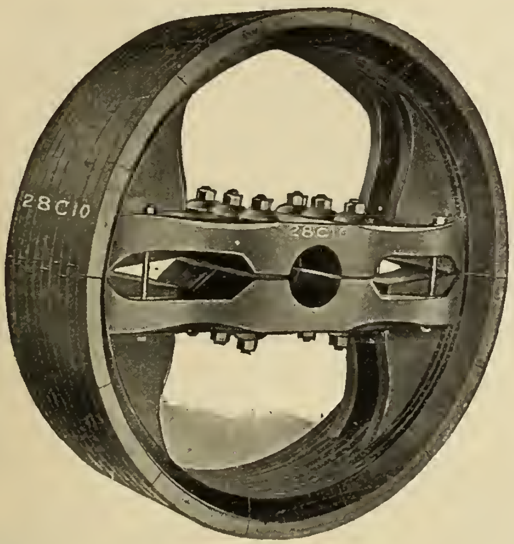
Work on Sherbrooke's waterworks system is progressing.

A number of water mains were ordered to be laid in Vancouver

A satisfactory test was made at Palmerston of the new waterworks.

Work is being pushed on Guelph's new $120,000 waterworks system.

TRANSMISSION APPLIANCES



FAIRBANKS WOOD SPLIT PULLEYS

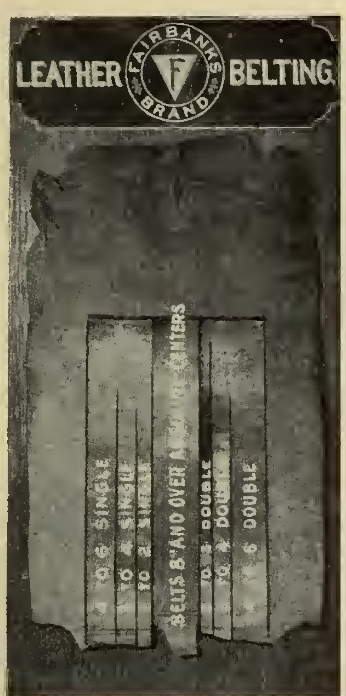
are made from well-seasoned lumber, carefully selected and dried. Each segment, besides being glued, is nailed to the next one. The Web construction of the arm strengthens the rim and prevents it from working loose at the arm.

Fairbanks Universal Hangers

are practically self-adjusting.

RIM OILING BOXES

Bearing can be put into frame or removed without taking off yoke.



FAIRBANKS OAK BARK TANNED LEATHER BELTING

is taken from that section of the hide running four feet from the tail towards the shoulder and for fifteen inches on either side of the back bone.

This part of the hide can be absolutely depended upon to yield the highest grade of belting.

The Canadian Fairbanks Co., Ltd.

MONTREAL

TORONTO ST. JOHN, N.B. WINNIPEG CALGARY VANCOUVER

Melita, Man., proposes establishing a $3,000 water supply system.

A waterworks system to cost $38,000 will be installed at Chesley, Ont.

Many new hydrants and water mains are being constructed in Queen's Park, London.

Waterloo's new $30,000 sewage disposal plant has been completed and is now in operation.

Coaticook, P.Q., is contemplating the equipping of a water power plant and will spend $25,000.

The tunnel under the bay, in connection with Toronto's waterworks system, is now practically finished.

Trade Notes.

The National Mfg. Co., Pittsburg, has bought out the Canada Stove Co., Ottawa.

The contract for the Great Chaudiere dam, which is to be built at Ottawa, has been let to Quinlan & Robertson, contractors, Montreal, Que.

McDougall & McRae, consulting engineers, Ottawa, Ont., have dissolved partnership. The business will in the future be carried on by John B. McRae.

R. O. Hopkinson, Waterville, spent some time in Montreal during August arranging for the sale of a new jack, which he has invented and is placing on the market.

The Canadian Tap and Die Co., Limited, of Galt, Ont., have opened a store in Toronto, at 196 King Street West, for the convenience of their city customers. This firm are also represented in Canada by the Milroy-Harrison Co., Toronto.

The Independent Pneumatic Tool Co., Chicago, have appointed H. W. Petrie, Ltd., Toronto and Montreal, and Vancouver, as exclusive Canadian sales agents for Thor pneumatic tools and appliances. H. W. Petrie will carry a complete stock in their various warehouses.

Dodge Mfg. Co., of Toronto, have shipped about 300,000 lbs. of machinery of their manufacture to the Grand Trunk Pacific elevator at Tiffin, Ont. Shipment has been made during June and July. Experts have already said that this included some of the finest grain elevator machinery ever made anywhere by anybody.

Mayor Shurtleff, of Coaticook, has been awarded the contract from the Asbestos and Asbestic Co., Danville, Que., to erect new buildings, the main one being six storeys high and 70 by 100 feet. The company also intends erecting crusher, dryer and store buildings, equipping them with new machinery at a cost of about $100,000.

The constantly increasing trade of the S. Obermayer Co. in and around Erie, Pa., has made it necessary for them to open a branch warehouse in that city. Mr. W. L. Scott, well known to the foundry trade in that section, is in charge, and a full line of foundry facings, core compounds, plumbago and blackings will be carried for the present; and just as soon as conditions warrant their doing so, a complete line of other foundry facings and foundry supplies manufactured by them will be carried in stock there.

A new machine shop and foundry is under construction for the Goldschmidt Thermit Co., 90 West Street, New York City. The building occupies a site 34x90 feet in size, just back of their present factory in Jersey City, and it is to be fitted up for the purpose of handling to better advantage the extensive repair work which is now being carried on at these works. Traveling cranes will be provided, and no ex-

pense will be spared to make the building the most complete Thermit repair shop in the country. Special attention will be paid to the rapid execution of the repairs to electric motor cases. truck-frames, cast steel gear wheels, crank shafts, and, in fact, any wrought iron and steel sections not exceeding 2,000 lbs. in weight.

Evidences of Industrial Revival.

The Czerwinski Box Co., which has a large factory in Winnipeg, is very busy just now.

The Wartman & Ward Mfg. Co., London, expect soon to have its full staff at work again.

The Canadian Westinghouse Co., and the Norton Mfg. Co., Hamilton, are now running full time.

Shirley & Company, St. Andrews, P.Q., will extend their plant, and will build a new warehouse.

The Manitoba Gypsum Co., Winnipeg, is doubling the capacity of its warehouse at St. James.

The Farmers' Binder Twine Co., Brantford, has again commenced operations, after being closed for some time.

The Canada Small Wares new factory at St. Mary's, Ont., will be increased in size by the addition of another storey.

The B.C. Sugar Refining Co. will erect a $60,-Granby Smelter is increasing its output. From the beginning of the year to the end of July 604,305 tons were shipped.

The factory of Clare Bros., at Preston, Ont., is very busy and preparations are being made for one of the best seasons in the history of this firm.

The Belgo-Canadian Pulp Company, Shawinigan, Que., have recently made additions to their plant, increasing its capacity from fifty to eighty tons daily.

The Montreal Cotton Company's mills at Valleyfield have resumed work at practically their full capacity, between 2,000 and 2,500 operators being engaged.

Reports from the various factories in Preston, Ont., give a bright outlook for the future. Most of them are running full time, and some report as large a business as last year.

A prominent lumber-traveler says in a couple of months there will be a big demand for lumber from British Columbia mills by the people of the wheat belt in the Prairie Provinces.

The plant of the Dominion Iron & Steel Co. at Sydney, C.B., is now in continuous operation. It is expected that during the present year the output of the mills will be more than doubled.

"Orders are coming in nicely," said J. W. Allison, of the Canada Tin Plate Works, Morrisburg, "and before long we expect to have 500 men employed." At present 180 men are employed.

The management of the Baynes Carriage Co., Hamilton, reports business to be picking up quite rapidly. A week or so ago the firm made a big shipment of two-wheeled carts to Cape Town, South Africa.

The Stratford Manufacturing Co., Stratford, after four months' actual running, find it necessary to enlarge their premises. The company started operations the first of April, and have been running 60 hours a week ever since.

Ahrams & Sons, Moncton, N.B., are now at work in all parts of their new machine shop. The building is not yet quite completed, but is expected to be finished in a short time. Some seventeen or eighteen men are at present employed.

The Montreal Pipe Co., Londonderry, N. S., are building an addition to their plant and will soon give employment to forty more men, making a total of 140 men at the works. The general outlook at Londonderry is improving and everything is reported to be "humming."

The R. M. Beal Leather Manufacturing Co., Lindsay, has bought the Robinson Leather Co., of the same place. A large packing house has lately been erected to take care of increased output, and the Hudson's Bay Co. and Northwest Mounted Police have placed large orders for larrigans with the firm.

The Sydney Cement Works has been placed on double shift. The increased output is needed to keep up with the demand, which is growing rapidly. Sydney cement is being used for the foundation of the new technical school in that city, and it is likely that some of it will be used by the Grand Trunk Pacific in its construction work.

A boom in gold mining in Nova Scotia this season seems certain and already there has been considerable movement in mining matters that marks an improvement in the situation with more work and, consequently, more trade. The indications are that Halifax County is to benefit largely, perhaps more so than any of the other gold mine counties in the province. A great many mines have changed hands; new machinery is being installed and great activity is noted all along the line.

The stove foundry of W. J. Copp & Son is a Fort William institution manufacturing stoves, ranges and furnaces, and they have a plant that has been gradually growing since they first located in that city. Harold E. Copp, the manager of the company, says he has been agreeably surprised by the trade done this summer, his June sales having exceeded those of June, 1907, by at least 20 per cent. His business has been showing a steady increase each year that he has been running, and even last year he managed to maintain some amount of increase.

Building Notes.

The Canadian Silk Co. will erect a $10,000 factory at Toronto.

A factory building will be erected at Montreal for the General Fire Extinguisher Co.

Kent & Cox have the contract for S. H. C. Miner's new rubber factory at Granby, Que.

An elevator will be erected at Cayley, Alta., by the Nanton Lumber & Grain Company.

Plans have been prepared for the $25,000 warehouse to be erected at Calgary for W. H. Blow. 000 steel and concrete filter building at Vancouver.

McDonald, Wilson & Snider have the contract for the $95,000 extensions to the Vancouver general hospital.

The Imperial Steel & Wire Company, of Toronto, are shortly to erect a factory building at Fort William.

A plant for the manufacture of concrete for building purposes, chimneys, etc., is being erected at Ventnor, Ont.

The Sussex, N.S., Universal Spring Co. will enlarge their present establishment by building a factory 100x40 feet three storeys high.

The Crow's Nest Pass Coal Co. will rebuild immediately the plant destroyed by fire at Fernie. About $200,000 will be expended.

Mayor Shurtleff, Richmond, Que., has the contract for building the $40,000 factory for the Asbestos and Asbestic Co. at Danville, Que.

Work on the new G.T.R. shops at Stratford is progressing. By the end of the month all the steel erection will have been completed.

The Vancouver Construction Co., a subsidiary company of the Victor Cement Block and Machine Co., is erecting a $25,000 block on Westminster Ave.

The Hobbs Plate Glass Works, London, will be rebuilt without further delay, and one of the biggest glass-making plants in the country will be put up.

H. Stead, New Westminster, B.C. is negotiating for a site of sixty feet water frontage, on which he proposes to erect a plant for the manufacture of launches.

Riddolls & Wright have started work on the new broom factory and workshops at the Ontario Institute for the Blind, at Brantford. The contract amounts to $7,000.

The new Prague Flour Mills, Moose Jaw, will be enlarged from a 300 to a 1,000 barrel mill. A new elevator and a new oatmeal mill will also be erected by the company.

The James Stuart Electric Co. have been negotiating with the City of Winnipeg, Man., with a view to the erection of a factory for the manufacture of water meters.

The Imperial Oil Company, Saskatoon, has received a tender for the erection of their warehouse at a contract price, $25,000. In all probability, building operations will be commenced in the near future.

The erection of a grain elevator has been begun at Delisle, Sask., and it is said that several more will follow as soon as the new railway is in operation. Nebraska men are interested in the concern.

The Pigeon River Lumber Company are negotiating with Port Arthur for the erection of a pulp mill to turn out fifty tons of ground wood per day. The town owns a municipal power plant, and the company asks a free site and 5,000 horse-power at n reasonable price and fixed taxation for ten years.

The Bell Telephone Company will extend their present building at Quebec and erect an additional storey. The company will install entirely new equipment, including expanded metal lockers. The total estimated cost is placed at $200,-000.

The Dominion Government has voted $10,6C5,-721 for public works throughout the country, mostly for public buildings. These latter total 209, divided as follows: Quebec, 50; Ontario, 82; New Brunswick, 10; Manitoba, 12; Nova Scotia, 15; Saskatchewan and Alberta, 20; British Columbia, 17; Prince Edward Island, 1.

Plans have been prepared for the erection of buildings in connection with the Grand Trunk Pacific terminals at Fort William. They call for six elevators, four with a storage capacity of 40,000,000; three freight sheds, 90 by 70 feet, and a coal dock with a capacity of 1,500,000 tons, as well as a roundhouse of 64 stalls. Provision will be made in the yards for the accommodation of 3,600 cars.

Companies Incorporated.

Inter-Agents, Limited, Toronto; capital, $40,000; to manufacture stoves, hardware, etc. Provisional directors, G. Nohle, G. R. Sproat and H. Ferguson, all of Toronto.

The W. A. Moore Co., Meaford, Ont.; capital, $40,000; to manufacture mantels and high-class woodwork. Provisional directors, W. A. Moore, W. Johnston and H. R. Clelland.

The Wood Fibre and Excelsior Co., Toronto; capital, $40,000; to manufacture articles made of wood. Provisional directors, A. R. Bickerstaff, F. H. Potts, T. A. Silverthorn, Mary G. Carroll and Edith M. Carruthers.

The Hoffman Patents, Ltd., Toronto; capital, $10,000; to manufacture boilers, engines and machinery. Provisional directors, C. T. G. Croft, G. B. Morgan and Geo. Croft, all of Toronto.

Zenith Mfg. Co., Toronto; capital, $40,000; to manufacture machinists' tools and machine supplies. Provisional directors, C. C. Moncrieff, Toronto; B. P. Corey and G. G. Moncrieff, of Petrolea.

The Lorne Power Co., Victoria Mines; capital, $300,000; to produce and sell electricity. Provisional directors, Sir Geo. A. Drummond, of Montreal, and B. Mohr and R. Mathias, London, Eng.

The Vacuna Co., Montreal; capital, $45,000; to manufacture appliances for cleaning carpets, etc. Provisional directors, W. Rowbotham, J. A. Ewing, F. B. Locker, A. D. Stewart, C. Norris and J. Rownt.

The Hamilton Brick Co., Toronto; capital, $40,000; to manufacture bricks, tiles, etc., and iron tools used in the erection of buildings. Provisional directors, S. Thompson, G. E. Bevan and A. F. Caldwell.

Ontario and Manitoba Flour Mills, Ottawa; capital, $750,000; to manufacture flour, etc. Provisional directors, A. W. Fraser, J. G. Gibson, J. Mulhall, H. H. Williams, J. Gibson, A. G. Mather and N. J. Ker.

The J. H. Hauson-Tilley Co., Montreal; capital, $145,000; to manufacture refrigerators, screen doors and milling tools. Directors, J. H. Hanson, A. Tilley, D. Beatty, R. Lapierre, and John W. Blair, all of Montreal.

The Seymour Power and Electric Co., Campbellford, Ont.; capital, $1,000,000; to produce and accumulate electricity. Provisional directors, A. G. Ross, M. L. Gordon, G. C. Loveys, J. F. H. McCarthy and W. S. Edwards.

The Ontario Railway Signal Co., Toronto; capital, $40,000; to manufacture air compressors, electrical machines and cars and machinery for all kinds of power. Provisional directors, G. Russell, Ethyl M. Lindsay and Violet Waldock.

Canadian Weber Gas Engine Co., Toronto; capital, $300,000; to manufacture producer gas and gasoline engines. Provisional directors, R. G. Weber, Kansas City, Mo.; R. J. Goudy, H. Macdonald, J. A. Goudy and H. Kiteley, Toronto.

The Universal Signal Co., Toronto; capital, $1,000,000; to manufacture air compressors and electrical machines. Provisional directors, T. R. Meredith, G. E. Foster, J. A. Street, J. A. McEvoy, G. Russell, Mabel Lindsay and Violet Waldock.

The Standard Railway Equipment Co., Montreal; capital, $49,000; to manufacture appliances for railway cars and engage in smelting metals. Provisional directors, F. H. Markey, W. W. Skinner, G. G. Hyde, R. C. Grant and C. E. Hyde.

Seymour Power and Electric Co., Campbellford, Ont.; capital, $1,000,000; to produce, accumulate and sur electricity. Provisional directors, A. G. Ross, M. L. Gordon, G. C. Loveys, J. F. H. McCarthy and W. S. Edwards, all of Toronto.

The Interurban Electric Co., Toronto; capital, $400,000; to take over and extend the business of the Stark Telephone, Light & Power System. Provisional directors, E. S. Edmondson, F. Grundy, A. N. Morine, M. McDonald, C. H. Porter, G. L. Lewis and G. T. Turnbull.

The Peterboro Lubricator Manufacturing Co., Peterboro; capital, $100,000; to manufacture patent automatic grease cups. Provisional directors, W. Harstone, R. A. Elliott, E. R. Wilson, Peterboro; J. F. Lewis, Philadelphia, and M. W. Boerema, Youngstown, Ohio.

The Northern Pipe Line Co., Chatham; capital, $1,000; to construct and operate pipe lines for the transportation of oil and gas. Pro-

visional directors, D. A. Gordon, Wallaceburg; G. E. Avery, Detroit; T. K. Holmes, Chatham; W. G. Ryan, Chatham, and R. L. Pattinson, Buffalo.

Vulcan Iron Works Extending.

Alex. Fleck, proprietor Vulcan Iron Works, is erecting large brick and concrete buildings for pattern shop and storage. The buildings are 120x40 and 45x12, respectively, and are situated on Sparks Street.

Manufacturers' Association.

Arrangements have been completed for the annual convention of the Canadian Manufacturers' Association in Montreal from September 16 to 18, inclusive.

Facts Concerning Inglis Contract Dispute.

When the contract for the new pumping engines for the City of Toronto was given to the John Inglis Co., Toronto, it was agreed that he would only work 9 hours per day. It appears that only 9 hours' work per day was put on the city work, but the men were then turned over to other work for another hour each day. Through the discharge of two union men, the union took the matter up, and brought it to the attention of the city council. The Board of Control wished to cancel the contract, but City Solicitor Chisholm stated that the board could not legally do this. The board have finally decided not to do anything in the matter at the present time.

Exhibition Time Once More.

The Canadian National Exhibition will be practically opened on Aug. 29, although it will not be officially opened until three days later. The programme this year provides for an exhibition which will be greater than ever. In the Machinery Hall there will be a number of new exhibitors; but at the same time a number of firms have dropped out. One of the new exhibitors is the John Steptoe Shaper Co., Cincinnati, O. Their exhibit will be included in that of Rice Lewis & Son, Ltd., their Canadian agents. One of the machine tool manufacturers who exhibited last year is dropping out this year, because they consider it a waste of effort to exhibit. A large machine tool dealer who put up a splendid exhibit last year, will not be represented this year, and for the same reason. And that's the way it will be until the Exhibition authorities put up a new machinery hall. It is needed badly. Until there is something for practical men to see at the exhibition, it cannot be expected that they will come in any great numbers. A new building, with proper transportation facilities would attract good exhibitors of machinery, and a representative number of them. Then it will be a paying investment, as practical men will find it worth while coming round and investigating. Until then we cannot expect a very representative machinery exhibit. Power machinery is always pretty well represented, and this year is no exception.

The Hydro-Electric Contract.

F. H. McGuigan signed an agreement with the Hydro-Electric Power Commission for the construction of transmission lines from Niagara to St. Thomas in the west and Toronto in the east, 293 miles in all, for $1,270,000. The agreement was also signed by the Hydro-Electric Commission to accept the tender of the F. H. McGuigan Construction Company, whose tender was actually the lowest presented, the difference between figures it quoted and those of the highest sent in being $500,000.

The McGuigan tender was one of twenty-seven, there being one other bulk tender; fifteen for towers; five for cables, and five for transmission line. The successful tender is remarkable as being wholly Canadian, which, in face of so many English and American tenders, is regarded as very creditable to native enterprise. Steel towers numbering 3,176 will be supplied by the Canadian Bridge Company, Walkerville, and the Ontario Iron and Steel Company, Welland. They will consume 6,554 tons of steel. The cables will be of aluminum wire weighing 1,014,209 pounds. This will be supplied by the Northern Aluminum Company of America, at Shawinigan Falls.

For the double telephone lines over the right of way 140,000 pounds of wire will be required, and guard lines and lightning protection will also take a large quantity of metal. Separate tenders were sent in for several portions of the work, but the McGuigan tender was lower than the lowest combination of any of these. The McGuigan tender was therefore accepted on its merits.

A cheque for $35,000 accompanied the tender, and a bond for the execution of the work, amounting to $175,000, will be provided. Work is to be completed within fifteen months of the signing of the contract, so that the line will be ready to deliver power in December of next year.

The Ontario Government is considering the extension of the Niagara power line to Whitby, Port Hope, Bowmanville, Cobourg and other towns in that section of the province.

CATALOGUES WORTH HAVING.

CARBORUNDUM.—A very complete, handsome and instructive catalogue of the Carborundum Co., Niagara Falls, N.Y., on carborundum, how it is made, its uses, its characteristics and its products. It is a complete corundum wheel catalogue, and a most useful reference to users of grinding machinery.

PIPE THREADING TOOLS—Catalogue from McDonald & Sons, 128 Craig St. W., illustrating and describing the Toledo and Jardine pipe threading devices.

IRON AND STEEL TUBES—The 24th edition of John Spencer & Co., Ltd., Wednesbury, Staffs, Eng., containing quotations for iron and steel tube fittings of every description.

MINE EQUIPMENT—Bulletin 25 from Jeffrey Mfg. Co., Columbus, Ohio, showing the wide range of their instalations for handling coal and ores. About seventy-five illustrations of conveying apparatus installed in various mines and storage bins are given.

MECHANICAL MACHINISTS' TOOLS—Catalogue from Williams & Wilson, Montreal, giving cuts and prices of Brown & Sharpe's machinists' tools, rules, etc.

ELECTRIC SWITCHES—Price list of type "D" switches from the Hill Electric Mfg. Co., 1560 St. Lawrence Boulevard, Montreal.

ASBESTOS PROTECTED METAL—A catalogue describing this patented material for roofing, siding and ceiling, which is fireproof, waterproof, and fumeproof, the Asbestos Protected Metal Co., Canton, Mass. It is illustrated and tells how the material is made.

TEN COMMANDMENTS FOR BUSINESS WORLD—The Interstate Sand Co., Cleveland, O., send out a folder containing Twentieth Century Ten Commandments for the Business World, which are clever and strike the nail on the head. Here is the eighth: "Thou shalt not fail to blow thine own horn, for he who is afraid to blow his own horn at the proper occasion findeth nobody standing ready to blow it for him."

DISC AND PROPELLOR FANS—Bulletin No. 50, Sheldon's Limited, Galt, Ont., descriptive of disc and propellor fans. It is well illustrated and is complete. Some useful fan data is contained in tables.

GISHOLT 42-IN. VERTICAL BORING MILL—Leaflet for the Gisholt binder, illustrating and describing the Gishalt standard 42-inch boring mill. Gisholt Machine Co., Madison, Wis.

ALUNDUM—Small booklet from the Norton Co., Worcester, Mass., containing a neatly-illustrated and well-written description of alundum and how it is made.

ELECTRICALLY DRIVEN SWING SAW—Circular descriptive of the Reliance electrically driven swing saw, Carse Bros., engineers, 165 Broadway, New York.

NORTHERN CRANES—A small booklet of the Northern Engineering Works, Detroit, Mich., illustrating in condensed form, by means of about 40 cuts, many of their designs for electric traveling cranes, hand power cranes and electric hoists. The booklet is meant merely as a reminder of the different types of Northern cranes.

FRICTION CLUTCH PULLEYS—Bulletin No. 1207 of Allis-Chalmers-Bullock, Ltd., Montreal, 7 pages, telling about the Allis-Chamlers friction clutch pulleys and cut-off couplings, giving price list and **dimensions**.

DISC GRINDERS—Very handsome catalogue from the Gardner Machine Co., Beloit, Wis., on "Gardner's Improved" disc grinders. The catalogue contains complete descriptions of the different styles of grinders made by this firm, and also a record of tests, showing what disc grinders can do under different circumstances.

CROCKER-WHEELER BULLETINS—A number of bulletins sent out by the Canadian Crocker-Wheeler Co., Ltd., Montreal, in a folder. Anyone wishing to start a file of these bulletins should send now for this set and the cover.

CONVENTION OF C.A.S.E.

The nineteenth annual convention of the Canadian Association of Stationary Engineers was held in Windsor, from August 11 to 14. The secretary reports a satisfactory and successful convention. The executive officers of the association for the past year were:

Past President—Jos. Ironsides, Hamilton.

President—E. Grandbois, Chatham.

Vice-President—C. Kelley, Chatham.

Treasurer—A. M. Wickens, Toronto.

Conductor—W. McGhie, Toronto.

Doorkeeper—J. J. Negg, Guelph.

Secretary—W. A. Crockett, Mt. Hamilton.

Features of the convention were the automobile ride through Detroit, visiting several power plants and making a circuit of Belle Isle Park, this entertainment being furnished by the Nationaal Associatian of Stationary Engineers; the moonlight excursion given by W. T. Wing, Detroit; the trolley ride to Kingsville; and the dinner of course.

The officers for the ensuing year are:

President—Chas. Kelley, Chatham.

Vice-President—W. McGhie, Toronto.

Secretary—W. A. Crocket, Mt. Hamilton, P.O.

Treasurer—A. M. Wickens, Toronto.

Conductor—J. J. Negg, Guelph.

Doorkeeper—W. Norris, London.

The next place of meeting will be London.

The supply men present were:—W. R. Stavert, representing Jenkins Bros., Montreal; R. E. Dynes, W. T. Wing & Co., Detroit and Windsor; F. G. Robinson, Canadian Fairbanks Co., Toronto; H. C. Austen, Dunlop Tire & Rubber Co., Toronto; Mr. Cole, Philip Carey Mfg. Co., Toronto; E. A. Wilkinson, Canadian representative of the Lunkenheimer Co., Cincinnati; L. H. Rumage, V. D. Anderson Co., Cleveland; P. J. Sweeney, Penberthy Injector Co.

The Canadian Engineers' Exhibitors had a meeting and elected officers as follows:

Hon. President—Wm. Norris, London.

President—W. R. Stavert.

Vice-President—Mr. Cole.

2nd Vice-President—E. A. Wilkinson.

Treasurer—F. G. Robinson.

Assistant Secretary—E. A. Heatherington.

Men are forever forsaking fortune when she is about to smile.

You cannot expect the world to have a good opinion of you unless you set the example.

He who will not accept orders has no right to give them: he who will not serve has no right to command, he who cannot keep silent has no right to speak.

CANADIAN MACHINERY BUYERS' DIRECTORY

To Our Readers—Use this directory when seeking to buy any machinery or power equipment. You will often get information that will save you money.

To Our Advertisers—Send in your name for insertion under the heading of the lines you make or sell.

To Non-Advertisers—A nominal rate of $1 per line a year is charged non-advertisers.

Abrasive Materials.
The Canadian Fairbanks Co., Montreal.
Canadian Hart Wheels Ltd., Hamilton.
Rice Lewis & Son, Toronto.
Milroy-Harrison Co., Toronto.
Norton Co., Worcester, Mass.
H. W. Petrie, Toronto.
Carborundum Co., Niagara Falls, N.Y.
Stevens, F. B., Detroit, Mich.
Williams & Wilson, Montreal.

Air Receivers.
Allis-Chalmers-Bullock Montreal.
Canada Foundry Co., Toronto.
Canadian Rand Co., Montreal.
John McDougall Caledonian Iron Works Co., Montreal.

Alloys.
Goldschmidt Thermit Co., Toronto
Aluminium Corporation, Ltd., Toronto

Aluminum Ingots.
Aluminium Corporation, Ltd. Toronto

Aluminum Sheets.
Aluminium Corporation, Ltd., Toronto

Aluminum Wire.
Aluminium Corporation, Ltd., Toronto

Arbors.
Cleveland Twist Drill Co., Cleveland
National Twist Drill & Tool Co., Detroit
Owen Machine Tool Co., Springfield, Ohio

Arbor Presses.
Niles-Bement-Pond Co., New York.

Architectural Iron Workers.
Dynamic Machine Works Montreal.

Automatic Machinery.
Gardner, Robt. & Son, Montreal
National-Acme Mfg. Co., Cleveland

Automobile Parts.
Globe Machine & Stamping Co., Cleveland, Ohio.

Axle Cutters.
Butterfield & Co., Rock Island, Que.
A. B. Jardine & Co., Hespeler, Ont.

Babbit Metal.
Canada Metal Co., Toronto.
Lumen Bearing Co., Toronto.
Milroy-Harrison Co., Toronto.
Rice Lewis & Son, Toronto.
Tallman, J. N., & Sons, Hamilton

Barrels, Steel Shop.
Cleveland Wire Spring Co., Cleveland.

Barrels, Tumbling.
Detroit Foundry Supply Co., Windsor
Dominion Foundry Supply Co., Montreal
Hamilton Facing Mill Co., Hamilton.
Hyde, Francis & Co., Montreal
Falls Rivet & Machine Co., Cuyahoga Falls, Ohio
Globe Machine & Stamping Co., Cleveland, Ohio.
Northern Engineering Works, Detroit.
H. W. Petrie, Toronto.
Sly, W. W., Mfg. Co., Cleveland
Smith, J. D., Foundry Supply Co., Cleveland, Ohio
The Smart-Turner Mach. Co., Hamilton
Whiting Foundry Equipment Co., Harvey, Ill

Bars, Boring.
Hall Engineering Works, Montreal.
Niles-Bement-Pond Co., New York.

Bearings, Self-Oiling.
Wilson, J. C., & Co., Glenora, Ont,

Belt Tighteners.
Dodge Mfg. Co. Toronto

Belting, Chain.
Canada Machinery Exchange. Montreal.
Jeffrey Mfg. Co., Columbia, Ohio.
Milroy-Harrison Co., Toronto.
Waterous Engine Works Co., Brantford.

Belting, Cotton.
Canada Machinery Agency, Montreal.
Dominion Belting Co., Hamilton.
Rice Lewis & Son, Toronto.

Belt Dressing.
Stephenson Mfg. Co., Albany, N.Y.

Belting, Leather.
Canada Machinery Agency, Montreal.
The Canadian Fairbanks Co., Montreal.
Milroy-Harrison Co., Toronto
McLaren, J. C., Montreal.
Rice Lewis & Son, Toronto.
H. W. Petrie, Toronto.
Sadler & Haworth Montreal
Williams & Wilson, Montreal.

Bending Machinery.
John Bertram & Sons Co., Dundas, Ont.
Bliss, E. W., Co., Brooklyn, N.Y.
Ferracute Machine Co., Bridgeton, N.J.
Jardine, A. B. & Co., Hespeler, Ont.
Rice Lewis & Son, Toronto
London Mach. Tool Co., Hamilton, Ont.
National Machinery Co., Tiffin, Ohio.
Niles-Bement-Pond Co., New York.

Blowers.
Canada Machinery Agency, Montreal.
Detroit Foundry Supply Co., Windsor
Dominion Foundry Supply Co., Toronto
Hamilton Facing Mill Co., Hamilton
Hyde Francis & Co., Montreal
Kerr Turbine Co., Wellsville, N.Y.
Monarch Eng. & Mfg. Co., Baltimore, Md
Sheldon's Limited, Galt
Smith, J. D., Foundry Supply Co., Cleveland, Ohio

Blast Gauges—Cupola.
Dominion Foundry Supply Co. Toronto
Sheldons, Limited, Galt

Boilers.
Canada Foundry Co., Limited, Toronto.
Canada Machinery Agency, Montreal.
Goldie & McCulloch Co., Galt.
John McDougall Caledonian Iron Works, Montreal.
Owen Sound Iron Works Co., Owen Sound
H. W. Petrie, Toronto.
Robb Engineering Co. Amherst, N.S.
The Smart-Turner Mach. Co., Hamilton.
Waterous Engine Works Co., Brantford.
Williams & Wilson, Montreal.

Boiler Compounds.
Canada Chemical Mfg. Co., London, Ont.
Hall Engineering Works, Montreal.

Boiler Makers' Supplies.
Allen, John F. New York

Bolt and Nut Machinery.
John Bertram & Sons Co., Dundas, Ont.
Canada Machinery Agency, Montreal.
Gardner Robt. & Son, Montreal
Rice Lewis & Son, Toronto.
London Mach. Tool Co., Hamilton.
National Machinery Co., Tiffin, Ohio.
Niles-Bement-Pond Co. New York.
Waterbury Farrell Foundry & Machine Co., Waterbury, Conn.

Bolt Cutters.
Schuchardt & Schutte New York.

Boring Machines, Upright.
American Tool Works Co., Cincinnati.
John Bertram & Sons Co., Dundas, Ont.
London Mach Tool Co., Hamilton.
Niles-Bement-Pond Co., New York.

Boring Machine, Wood.
Independent Pneumatic Tool Co., Chicago, Ill.
London Mach. Tool Co., Hamilton.

Boring and Turning Mills.
American Tool Works Co., Cincinnati.
John Bertram & Sons Co., Dundas, Ont.
Canadian Machinery Agency, Montreal.
Gisholt Machine Co., Madison, Wis.
Rice Lewis & Son, Toronto
London Mach. Tool Co., Hamilton.
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.

Box Puller.
A. B. Jardine & Co., Hespeler, Ont.

Boxes, Steel Shop.
Cleveland Wire Spring Co., Cleveland.

Boxes, Tote.
Cleveland Wire Spring Co., Cleveland

Brass Melting Furnaces.
Monarch Eng. & Mfg. Co., Baltimore, Md

Brass Working Machinery.
Gardner, Robt. & Son, Montreal
Warner & Swasey Co., Cleveland, Ohio.

Brazing Cast Iron.
Dynamic Machine Works, Montreal.

Brushes, Foundry and Core.
Detroit Foundry Supply Co., Windsor.
Dominion Foundry Supply Co., Toronto
Hamilton Facing Mill Co., Hamilton.
Hyde, Francis & Co. Montreal
Smith, J. D., Foundry Supply Co., Cleveland, Ohio
Stevens, F. B., Detroit, Mich.

Buckets, Clam Shell.
Jeffrey Mfg. Co., Columbus, Ohio
Waiting Foundry Equipment Co., Harvey, Ill.

Buckets, Crab.
Jeffrey Mfg. Co., Columbus, Ohio

Bulldozers.
John Bertram & Sons Co., Dundas, Ont.
Lewis, Rice, & Son, Toronto.
London Mach. Tool Co., Hamilton, Ont
National Machinery Co., Tiffin, Ohio.
Niles-Bement-Pond Co., New York.

Cables, Aerial and Underground.
Bullivant & Co., London Eng.
Phillips, Eugene F., Electrical Works, Montreal

Canners' Machinery.
Bliss, E. W., Co., Brooklyn, N.Y.
Brown, Boggs Co. Hamilton
Ferracute Machine Co., Bridgeton, N.J.
Jeffrey Mfg., Columbus, Ohio
Wilson, J. C., & Co., Glenora, Ont.

Cars, Factory & Warehouse.
Hammant Steel Car & Engineering Works, Hamilton Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

Cars, Foundry.
Detroit Foundry Supply Co., Windsor
Dominion Foundry Supply Co., Montreal
Hamilton Facing Mill Co., Hamilton.
Hammant Steel Car & Engineering Works, Hamilton Ont.
Hyde, Francis & Co., Montreal
Monarch Eng. & Mfg. Co., Baltimore, Md.
Whiting Found Equipment Co., Harvey, Ill.

Castings, Aluminum.
Lumen Bearing Co., Toronto
Tallman, J. N., & Sons, Hamilton

Castings, Brass.
Chadwick Bros., Hamilton.
Hall Engineering Works, Montreal
Lumen Bearing Co., Toronto
Niagara Falls Machine & Foundry Co. Niagara Falls, Ont.
Owen Sound Iron Works Co., Owen Sound.
Reid Foundry & Mach. Co., Ingersoll.
Robb Engineering Amherst, Co., N.S.
Tallman, J. N., & Sons. Hamilton
Wilson, J. C., & Co., Glenora Ont.

Castings, Grey Iron.
Allis-Chalmers-Bullock Montreal.
Dodge Mfg Co., Toronto
Gardner, Robt. & Son, Montreal
Hall Engineering Works, Montreal.
Laurie Engine & Machine Co., Montreal.
John McDougall Caledonian Iron Works Co., Montreal,
Niagara Falls Machine & Foundry Co., Niagara Falls, Ont
Owen Sound Iron Works Co., Owen Sound.
Reid Foundry & Mach. Co., Ingersoll,
Robb Engineering Co., Amherst, N.S.
Smart-Turner Machine Co., Hamilton.
Stevens Co., Galt, Ont.
Wilson, J. C., & Co., Glenora, Ont.

Castings, Phosphor Bronze.
Lumen Bearing Co., Toronto

Castings, Semi-Steel.
Reid Foundry & Mach. Co., Ingersoll.
Robb Engineering Co., Amherst, N.S.

Cement Machinery.
Allis-Chalmers-Bullock, Limited, Montreal
Gardner, Robt. & Son, Montreal
Jeffrey Mfg. Co., Columbus, Ohio.
John McDougall Caledonian Iron Works, Co., Montreal
Owen Sound Iron Works Co., Owen Sound

Centreing Machines.
John Bertram & Sons Co., Dundas, Ont.
Gardner Robt. & Son, Montreal
Jeffrey Mfg Co., Columbia, Ohio
Lewis, Rice, & Son, Toronto
London Mach. Tool Co., Hamilton, Ont.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Hartford, Conn.

Centrifugal Pumps.
Gas & Electric Power Co., Toronto
John McDougall Caledonian Iron Works Co., Montreal.
Pratt & Whitney Co., Hartford, Conn.

Centrifugal Pumps—Turbine Driven.
Kerr Turbine Co., Wellsville, N.Y.

Chain Blocks.
Schuchardt & Schutte, New York.

Charcoal.
Detroit Foundry Supply Co., Windsor.
Doggett, Stanley, New York
Dominion Foundry Supply Co., Toronto
Hamilton Facing Mill Co., Hamilton.
Hyde, Francis & Co. Montreal
Smith, J. D., Foundry Supply Co., Cleveland, Ohio
Stevens, F. B., Detroit, Mich.

Chemicals.
Canada Chemical Co., London.

Chrome Brick.
Harbison - Walker Refractories Co. Pittsburg

Chucks, Drill and Lathe.
American Tool Works Co., Cincinnati.
John Bertram & Sons Co., Dundas, Ont.
Canada Machinery Agency, Montreal.
Cleveland Twist Drill Co., Cleveland
Gardner, Robt. & Son, Montreal
Hamilton Tool Co., Hamilton, Ont,
Jacobs Mfg. Co. Hartford, Conn
Ker & Goodwin, Brantford.
London Mach. Tool Co., Hamilton.
Milroy-Harrison Co., Toronto.
National Twist Drill & Tool Co., Detroit
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.
Rice Lewis & Son, Toronto.
Standard Tool Co., Cleveland.

Chucks (Planer or Milling.)
Gardner, Robt. & Son, Montreal
Holland's Mfg. Co., Erie, Pa.

Chucking Machines.
American Tool Works Co., Cincinnati.
Lewis, Rice, & Son, Toronto
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.
Warner & Swasey Co., Cleveland, Ohio

Circuit Breakers.
Allis-Chalmers-Bullock, Limited, Montreal
Canadian General Electric Co., Toronto.
Canadian Westinghouse Co., Hamilton.
Gas & Electric Power Co., Toronto.

Cloth and Wool Dryers.
B. Greening Wire Co., Hamilton.
Sheldons Limited, Galt

Coal Boring Machines.
Cumming, J. W., New Glasgow, N.S.

Coal Handling Machinery.
Jeffrey Mfg. Co., Columbus, Ohio

Coal Miners' Tools.
Cumming, J. W., New Glasgow, N.S.

Collars.
Dodge Mfg. Co., Toronto

Collectors, Pneumatic.
Sheldons Limited, Galt

Compressors, Air.
Allis-Chalmers-Bullock, Limited, Montreal
Canada Foundry Co., Limited, Toronto.
Canada Machinery Agency Montreal.
Canadian Rand Co., Montreal.
Canadian Westinghouse Co., Hamilton.
Darling Bros., Ltd., Montreal
Gas & Electric Power Co., Toronto.
Hall Engineering Works, Montreal, Que.
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John McDougall, Caledonian Iron Works Co. Montreal
Monarch Eng. & Mfg. Co., Baltimore, Md.

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Allis-Chalmers-Bullock, Montreal.
Gardner, Robt. & Son, Montreal

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Jeffrey M'f'g. Co., Columbus, Ohio.

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Canada Foundry Co., Limited, Toronto.
Canada Machinery Agency, Montreal.
Goldie & McCulloch Co., Galt.
Hall Engineering Works, Montreal.
Smart-Turner Machine Co., Hamilton.
Waterous Engine Co., Brantford.

Consulting Engineers.
Connor, A. W., Toronto
Fensom, C. J., Toronto
Hall Engineering Works, Montreal.
Jules De Clercy, Montreal.
Roderick J. Parke, Toronto.
T. Pringle & Son, Montreal.
Somerville, T. A., Hamilton
Stewart & McTaggart, Hamilton
Taylor, James, New Glasgow, N.S.

Contractors' Plant.
Allis-Chalmers-Bullock, Montreal.
John McDougall, Caledonian Iron Works Co., Montreal.
Niagara Falls Machine & Foundry Co., Niagara Falls, Ont.

Controllers and Starters Electric Motor.
Allis-Chalmers-Bullock, Montreal.
Canadian General Electric Co., Toronto.
Canadian Westinghouse Co., Hamilton.
Gas & Electric Power Co., Toronto.
T. & H. Electric Co., Hamilton.

Conveyor Machinery.
Dodge Mfg. Co., Toronto
Goldie & McCulloch Co., Galt
Jeffrey Mfg. Co., Columbus, Ohio.
Laurie Engine & Machine Co., Montreal.
Rice Lewis & Son, Toronto
John McDougall Caledonian Iron Works Co., Montreal.
Smart-Turner Machine Co., Hamilton.
Waterous Engine Works Co., Brantford.
Williams & Wilson, Montreal.
Wilson, J. C., & Co., Glenora, Ont.

Coping Machines.
John Bertram & Sons Co., Dundas, Ont.
London Mach. Tool Co., Hamilton.
Niles-Bement-Pond Co., New York.

Corundum and Corundum Wheels.
Canadian Hart Wheels Ltd., Hamilton

Core Cutting-off and Coning Machine.
Falls Rivet & Machine Co., Cuyahoga Falls, Ohio.

Core Compounds.
Buffalo Foundry Supply Co., Buffalo.
Detroit Foundry Supply Co., Windsor.
Dominion Foundry Supply Co., Toronto
Hamilton Facing Mill Co., Hamilton.
Hyde, Francis & Co., Montreal
Smith, J. D., Foundry Supply Co., Cleveland, Ohio.
Stevens, F. B., Detroit, Mich.

Core-Making Machines.
Falls Rivet & Machine Co., Cuyahoga Falls, Ohio.
Hyde, Francis & Co., Montreal
Smith, J. D., Foundry Supply Co., Cleveland, Ohio
Stevens, F. B., Detroit, Mich.

Core Ovens.
Detroit Foundry Supply Co., Windsor.
Dominion Foundry Supply Co., Montreal
Falls Rivet & Machine Co., Cuyahoga Falls, Ohio.
Hamilton Facing Mill Co., Hamilton.
Hyde, Francis & Co., Montreal
Sheldons Limited, Galt
Stevens, F. B., Detroit, Mich.
Whiting Foundry Equipment Co., Harvey, Ill.

Core Prints——Standard.
Falls Rivet & Machine Co., Cuyahoga Falls, Ohio.

Core Sand Cleaners.
Sly, W. W., Mfg. Co., Cleveland

Couplings.
Dodge Mfg. Co., Toronto
Gardner, Robt. & Son, Montreal
Owen Sound Iron Works Co., Owen Sound
Wilson, J. C., & Co., Glenora, Ont.

Couplings, Air.
Canadian Rand Co., Montreal.
Independent Pneumatic Tool Co., Chicago

Cranes, Electric and Hand Power.
Canada Foundry Co., Limited, Toronto
Canadian Pilling Co., Montreal
Canadian Rand Co., Montreal.
Cleveland Crane & Car Co., Wickliffe, Ohio.
Dominion Foundry Supply Co., Montreal
Gardner Robt. & Son, Montreal
Gas & Electric Power Co., Toronto
Hamilton Facing Mill Co., Hamilton.
John McDougall, Caledonian Iron Works Co., Montreal.
Milroy-Harrison Co., Toronto
Niles-Bement-Pond Co., New York.
Northern Engineering Works Detroit
Owen Sound Iron Works Co., Owen Sound
Smart-Turner-Machine Co., Hamilton.
Smith, J. D., Foundry Supply Co., Cleveland, Ohio.
Whiting Foundry Equipment Co., Harvey, Ill.

Crank Pins.
Sight Feed Oil Pump Co., Milwaukee, Wis.

Crank Pin Turning Machine.
London Mach. Tool Co., Hamilton.
Niles-Bement-Pond Co., New York.

Cross Head Pins.
Sight Feed Oil Pump Co., Milwaukee, Wis.

Crucibles.
Detroit Foundry Supply Co., Windsor
Dominion Foundry Supply Co., Montreal
Goldschmidt Thermit Co., Toronto
Hamilton Facing Mill Co., Hamilton.
Hyde, Francis & Co., Montreal
Seidel, R. B., Inc. Philadelphia
Smith, J. D., Foundry Supply Co., Cleveland, Ohio.
Stevens, F. B., Detroit, Mich.

Crushers, Rock or Ore.
Allis-Chalmers-Bullock, Montreal.
Jeffrey Mfg. Co., Columbus, Ohio.

Cupolas.
Detroit Foundry Supply Co., Windsor
Dominion Foundry Supply Co., Montreal
De Clercy, J., Montreal
Hamilton Facing Mill Co., Hamilton.
Hyde, Francis & Co., Montreal
Northern Engineering Works, Detroit
Sheldons Limited, Galt.
Smith, J. D., Foundry Supply Co., Cleveland, Ohio.
Whiting Foundry Equipment Co. Harvey, Ill.

Cupola Blast Gauges.
Dominion Foundry Supply Co., Montreal
Sheldons Limited, Galt

Cupola Blocks.
Detroit Foundry Supply Co., Detroit.
Dominion Foundry Supply Co., Toronto
Hamilton Facing Mill Co., Hamilton
Hyde, Francis & Co., Montreal
Northern Engineering Works, Detroit
Ontario Lime Association, Toronto

Cupola Blowers.
Canada Machinery Agency, Montreal.
Detroit Foundry Supply Co., Windsor
Dominion Foundry Supply Co., Toronto
Hamilton Facing Mill Co., Hamilton.
Hyde, Francis & Co., Montreal
Northern Engineering Works, Detroit
Sheldon's Limited, Galt.

Cupola Linings.
Maurer, Henry, & Son, New York.
Stevens, F. B. Detroit, Mich.

Cutters, Flue.
Independent Pneumatic Tool Co., Chicago Ill.

Cutters, Gear.
Milroy Harrison Co., Toronto.

Cutter Grinder Attachment
Cincinnati Milling Machine Co., Cincinnati

Cutter Grinders.
Cincinnati Milling Machine Co., Cincinnati

Cutters, Milling.
Abbott, Wm., Montreal
Becker Milling Machine Co., Hyde Park, Mass.
Cleveland Twist Drill Co., Cleveland
Hamilton Tool Co., Hamilton, Ont.
Milroy-Harrison Co., Toronto.
National Twist Drill & Tool Co., Detroit
Owen Machine Tool Co., Springfield, Mass.
Pratt & Whitney Co., Hartford, Conn.
Standard Tool Co., Cleveland.

Cutting-off Machines.
Armstrong Bros., Tool Co., Chicago
John Bertram & Sons Co., Dundas, Ont.
Burke Machinery Co., Cleveland, Ohio
Canada Machinery Agency, Montreal.
Rice Lewis & Son, Toronto.
London Mach. Tool Co., Hamilton.
H. W. Petrie, Toronto.
Pratt & Whitney Co., Hartford, Conn.

Cutting-off Tools.
Armstrong Bros. Tool Co., Chicago.
London Mach. Tool Co., Hamilton.
H. W. Petrie, Toronto.
Pratt & Whitney, Hartford, Conn.
Rice Lewis & Son, Toronto.
L. S. Starrett Co., Athol, Mass.

Damper Regulators.
Darling Bros., Ltd., Montreal

Dies.
Acme Stamping & Tool Co., Hamilton.
Armstrong Bros., Toronto
Banfield, W. H. & Son, Toronto
Bliss, E. W., Co., Brooklyn, N.Y.
Brown, Boggs Co., Hamilton
Ferracute Machine Co., Bridgeton, N.J.
Gardner, Robt. & Son, Montreal
Cleal, Joseph P., Toronto
Globe Machine & Stamping Co., Cleveland, Ohio.
Hall J. H., & Sons, Brantford
Hall, Jas. B., Toronto
Scott, Ernest, Montreal.
Stevens Co., Galt

Die-Making Machinery.
Stevens Co., Galt, Ont.

Die Stocks.
Canadian Tap & Die Co., Galt
Curtis & Curtis Co., Bridgeport, Conn.
Hart Manufacturing Co., Cleveland, Ohio
Jardine, A. B., & Co., Hespeler, Ont.
Milroy-Harrison Co., Toronto.

Dies, Opening.
W. H. Banfield & Sons, Toronto
Globe Machine & Stamping Co., Cleveland Ohio.
Jardine, A. B. & Co., Hespeler, Ont.
Pratt & Whitney Co., Hartford Conn.

Dies, Threading.
Canadian Tap & Die Co., Galt
Hart Mfg. Co., Cleveland
Jardine, A. B., & Co., Hespeler, Ont.
John Millen & Son, Ltd., Montreal.
Milroy-Harrison Co., Toronto.

Draft, Mechanical.
W. H. Banfield & Sons, Toronto.
Butterfield & Co., Rock Island, Que.
A. B. Jardine & Co., Hespeler
Pratt & Whitney Co., Hartford, Conn.
Sheldons Limited, Galt.

Drawn Steel, Cold.
Union Drawn Steel Co., Hamilton.

Drilling Machines, Locomotive.
American Tool Works Co., Cincinnati.
John Bertram & Sons Co., Dundas, Ont.
Bickford Drill and Tool Co., Cincinnati.
The Canadian Fairbanks Co., Montreal.
A. B. Jardine & Co., Hespeler, Ont.
London Mach. Tool Co., Hamilton, Ont.
Lewis, Rice & Son, Toronto
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.
Williams & Wilson, Montreal

Drilling Machines, Multiple Spindle.
American Tool Works Co., Cincinnati.
John Bertram & Sons Co., Dundas, Ont.
Bickford Drill & Tool Co., Cincinnati.
Canada Machinery Agency Montreal.
Rice Lewis & Son, Toronto.
London Mach. Tool Co., Hamilton, On
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.
Williams & Wilson, Montreal.

Drilling Machines, Radial.
American Tool Works Co., Cincinnati.
Bickford Tool & Drill Co., Cincinnati.
The Canadian Fairbanks Co., Montreal.
Rice Lewis & Son, Toronto
London Mach. Tool Co., Hamilton.
Niles-Bement-Pond Co., New York.
H. W. Petrie. Toronto.
Williams & Wilson, Montreal.

Drilling Machines, Turret.
John Bertram & Sons Co., Dundas, Ont.
London Mach. Tool Co., Hamilton.
Niles-Bement-Pond Co., New York.

Drilling Machines, Upright.
American Tool Works Co., Cincinnati.
John Bertram & Sons Co., Dundas, Ont
Hamilton Tool Co., Hamilton, Ont.
A. B. Jardine & Co., Hespeler, Ont.
Rice Lewis & Son, Toronto.
London Mach. Tool Co., Hamilton.

Drilling Machines, Horizontal.
John Bertram & Sons Co., Dundas, Ont.
Canada Machinery Agency, Montreal.
Lewis, Rice & Son, Toronto.
London Mach. Tool Co., Hamilton.
Niles-Bement-Pond Co., New York.

Drills, Bench.
Hamilton Tool Co., Hamilton, Ont.
Lewis, Rice & Son, Toronto.
London Mach. Tool Co., Hamilton.
Pratt & Whitney Co., Hartford, Conn.

Drills, Blacksmith.
Canada Machinery Agency, Montreal.
A. B. Jardine & Co., Hespeler, Ont.
London Mach. Tool Co., Hamilton.
National Twist Drill & Tool Co., Detroit
Standard Tool Co., Cleveland.

Drills, Centre.
Cleveland Twist Drill Co., Cleveland
Lewis, Rice & Son, Toronto.
Milroy Harrison Co., Toronto.
National Twist Drill & Tool Co., Detroit
Pratt & Whitney Co., Hartford, Conn.
Standard Tool Co., Cleveland, O.
L. S. Starrett Co., Athol, Mass.

Drills, Coal and Plaster.
Cumming, J. W., New Glasgow, N.S.

Drills, Electric.
Canadian Pilling Co., Montreal
Gas & Electric Power Co., Toronto.
Niles-Bement-Pond Co., New York.

Drills, High Speed.
Abbott, Wm., Montreal
Cleveland Twist Drill Co., Cleveland
Alexander Gibb Montreal.
Lewis, Rice & Son, Toronto.
Lincoln-Williams Twist Drill Co., Taunton, Mass.
Milroy-Harrison Co., Toronto.
National Twist Drill & Tool Co., Detroit
Pratt & Whitney Co., Hartford, Conn.
Richardson, John L. & Co., Toronto
Standard Tool Co., Cleveland, O.

Drills, Hand.
A. B. Jardine & Co., Hespeler, Ont.

Drills, Pneumatic.
Allen, John F., New York
Canada Machinery Agency, Montreal.
Canadian Rand Co., Montreal
Independent Pneumatic Tool Co., Chicago, New York
Niles-Bement-Pond Co., New York.

Drills, Ratchet.
Armstrong Bros. Tool Co., Chicago.
Cleveland Twist Drill Co., Cleveland
A. B. Jardine & Co., Hespeler,
Milroy-Harrison Co., Toronto.
National Twist Drill & Tool Co., Detroit
Pratt & Whitney Co., Hartford, Conn.
Standard Tool Co., Cleveland.

Drills, Rock.
Allis-Chalmers-Bullock, Montreal.
Canadian Rand Drill Co., Montreal.
Jeffrey Mfg. Co., Columbus, Ohio.

Drills, Sensitive.
American Tool Works Co., Cincinnati.
Canada Machinery Agency. Montreal.
Lewis, Rice & Son, Toronto.
McKenzie, D., Guelph, Ont.
Niles-Bement-Pond Co., New York

Drills, Twist.
Abbott, Wm., Montreal.
Cleveland Twist Drill Co., Cleveland
Alex. Gibb, Montreal.
Lincoln-Williams Twist Drill Co., Taunton, Mass.
Milroy-Harrison Co., Toronto.
Morse Twist Drill and Machine Co., New Bedford, Mass.
National Twist Drill & Tool Co., Detroit
Pratt & Whitney Co., Hartford, Conn.
Standard Tool Co., Cleveland.
Whitman & Barnes Mfg. Co., St. Catharines, Ont.

Dry Kiln Cars.
Hammant Steel Car and Eng Works, Hamilton.

Dry Kiln Equipment.
Sheldons Limited, Galt

Dump Cars.
Canada Foundry Co., Limited, Toronto
Dominion Foundry Supply Co., Montreal
Hamilton Facing Mill Co., Hamilton.
Hammant Steel Car and Eng. Works, Hamilton.
Hyde, Francis & Co., Montreal
Jeffrey Mfg. Co., Columbus, Ohio
Koppel, Arthur Co., New York
John McDougall, Caledonian Iron Works Co., Montreal.
Niles-Bement-Pond Co., New York.
Owen Sound Iron Works Co., Owen Sound
Waterous Engine Co., Brantford.

Dust Arresters.
Sly, W. W., Mfg. Co., Cleveland

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Allis-Chalmers-Bullock, Montreal.
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Canadian Westinghouse Co., Hamilton.
Gas & Electric Power Co., Toronto
Hall Engineering Works, Montreal, Que.
Lewis, Rice & Son, Toronto.
John Millen & Son, Ltd., Montreal.
Packard Electric Co., St. Catharines.
H. W. Petrie, Toronto.
T. & H. Electric Co., Hamilton.

Dynamos—Turbine Driven.
Gas & Electric Power Co. Toronto.
Kerr-Turbine Co., Wellsville, N.Y.

Electrical Books.
American Industrial Pub. Co., Bridgeport, Conn.

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Thwing, C. B., Philadelphia

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Hamilton Facing Mill Co., Hamilton.
Hyde, Francis & Co., Montreal
Milroy-Harrison Co., Toronto.
Stevens, F. B., Detroit, Mich.

Emery Stands.

McKenzie, D., Gueiph, Ont.

Emery Wheel Dressers.

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Canada Machinery Agency, Montreal.
Dominion Foundry Supply Co., Montreal
Gardner, Robt. & Son, Montreal
Hamilton Facing Mill Co., Hamilton.
Hyde, Francis & Co., Montreal
Milroy-Harrison Co., Toronto.
H. W. Petrie, Toronto.
Standard Tool Co., Cleveland.

Engineering Books.

American Industrial Pub. Co., Bridgeport, Conn.

Engineers and Contractors.

Canada Foundry Co., Limited, Toronto.
Darling Bros., Ltd., Montreal
Dynamic Machine Works, Montreal.
Gas & Electric Power Co., Toronto.
Goldie & McCulloch Co., Galt, Ont.
Hall Engineering Works, Montreal.
Laurie Engine & Machine Co., Montreal.
John McDougall, Caledonian Iron Works Co., Montreal.
Robb Engineering Co., Amherst, N.S.
The Smart-Turner Mach. Co., Hamilton.
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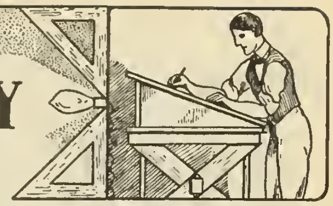

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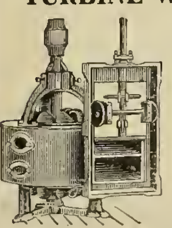

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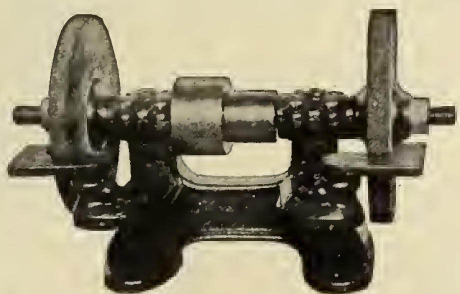

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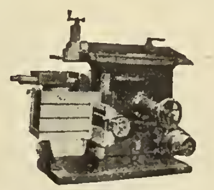

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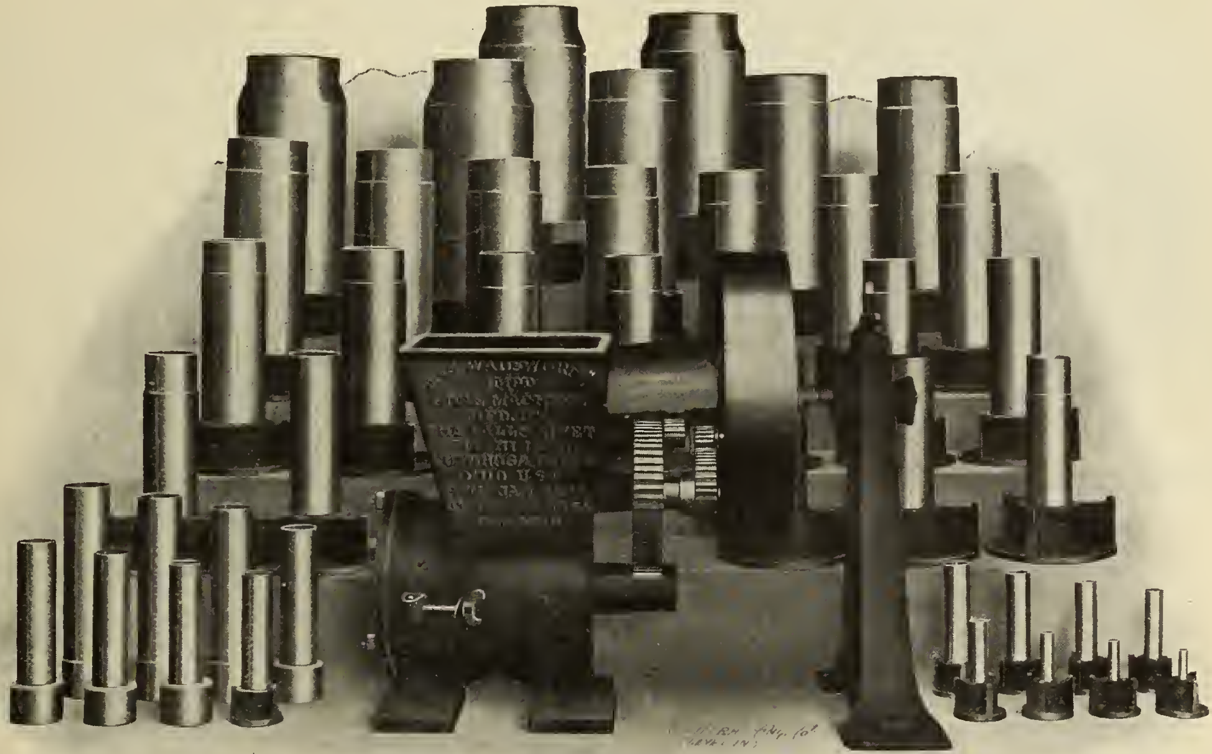

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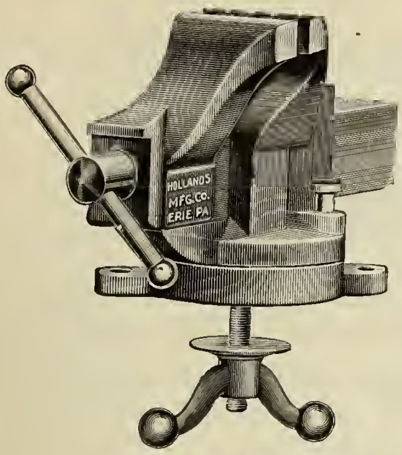

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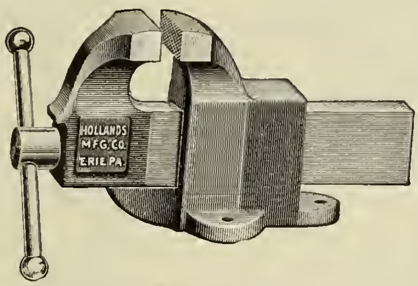

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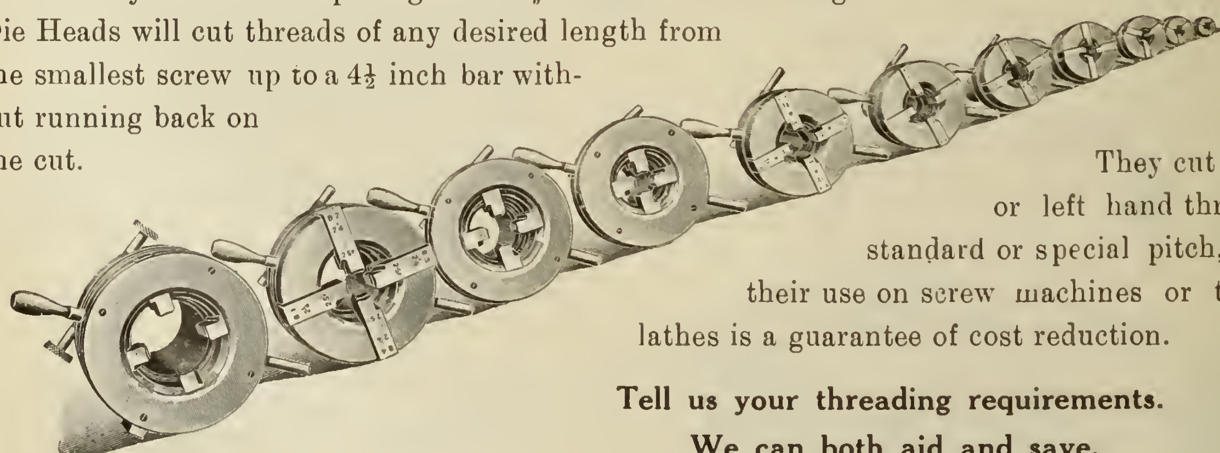

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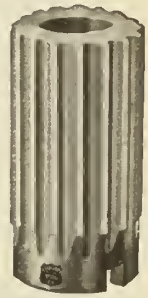

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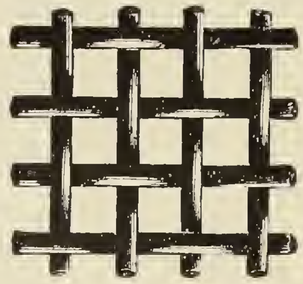

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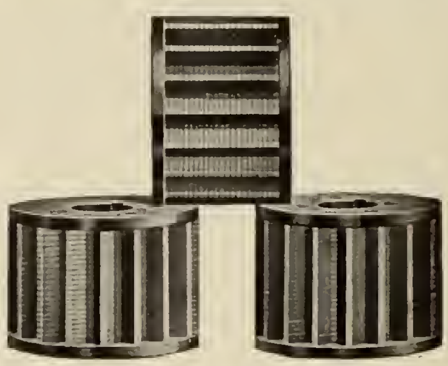

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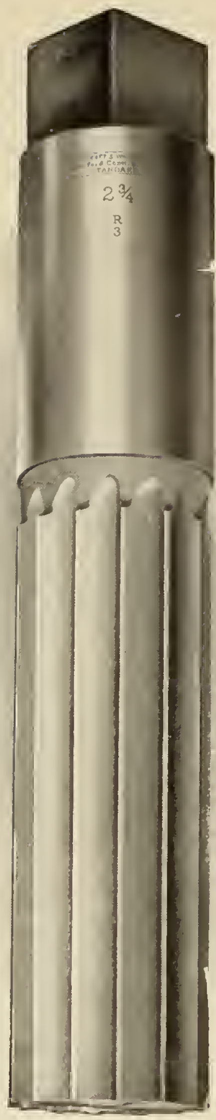
Vol. IV. Publication Office : Toronto, October, 1908. No. 10



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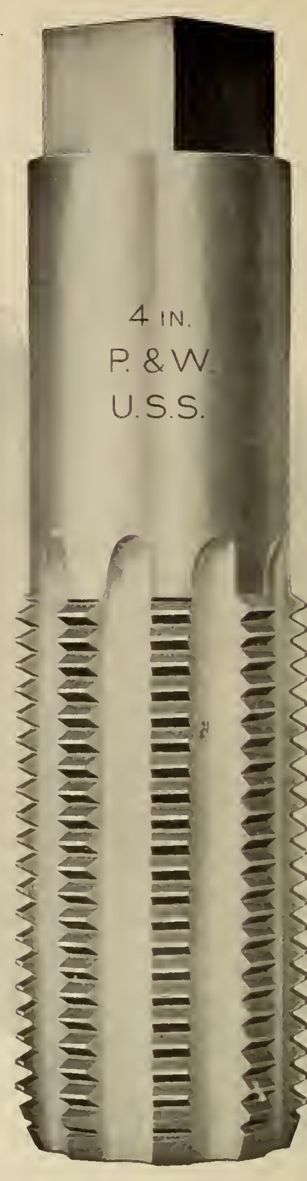

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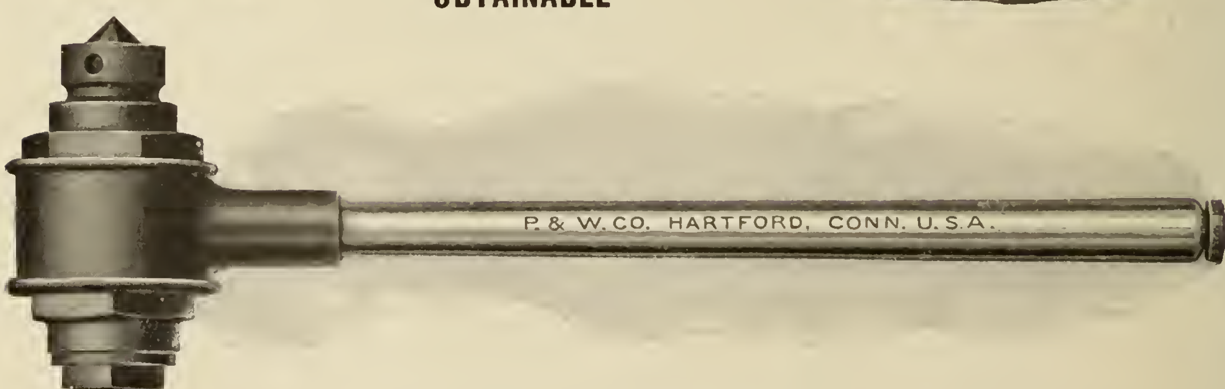

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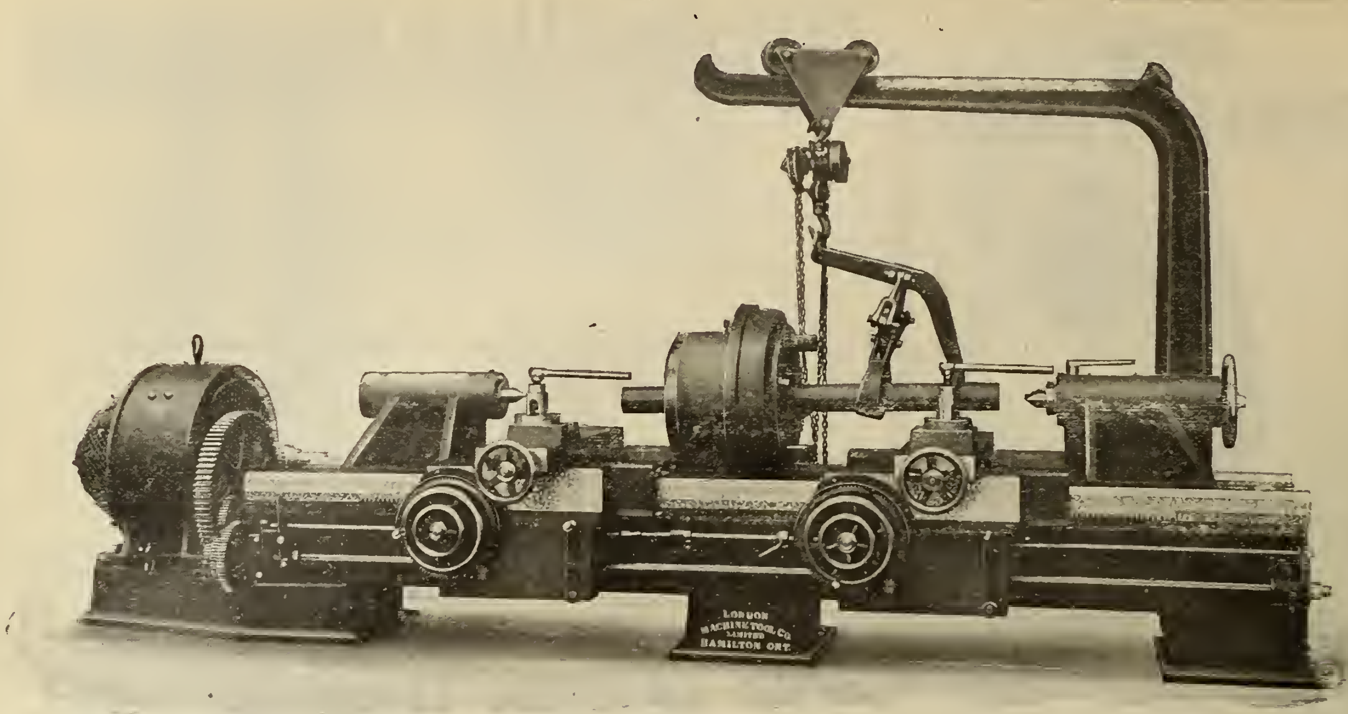

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¶ This is a lathe of great endurance, heavy, powerful, conveniently operated and rapid; designed for turning both ends of axles at the same time, and successfully meeting the requirements of High Speed Steel Service.

¶ Carriages are independent, conveniently arranged with three positive feeds for roughing and finishing cuts, operated and controlled by hand wheels placed within easy working reach.

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London Machine Tool Co., Limited

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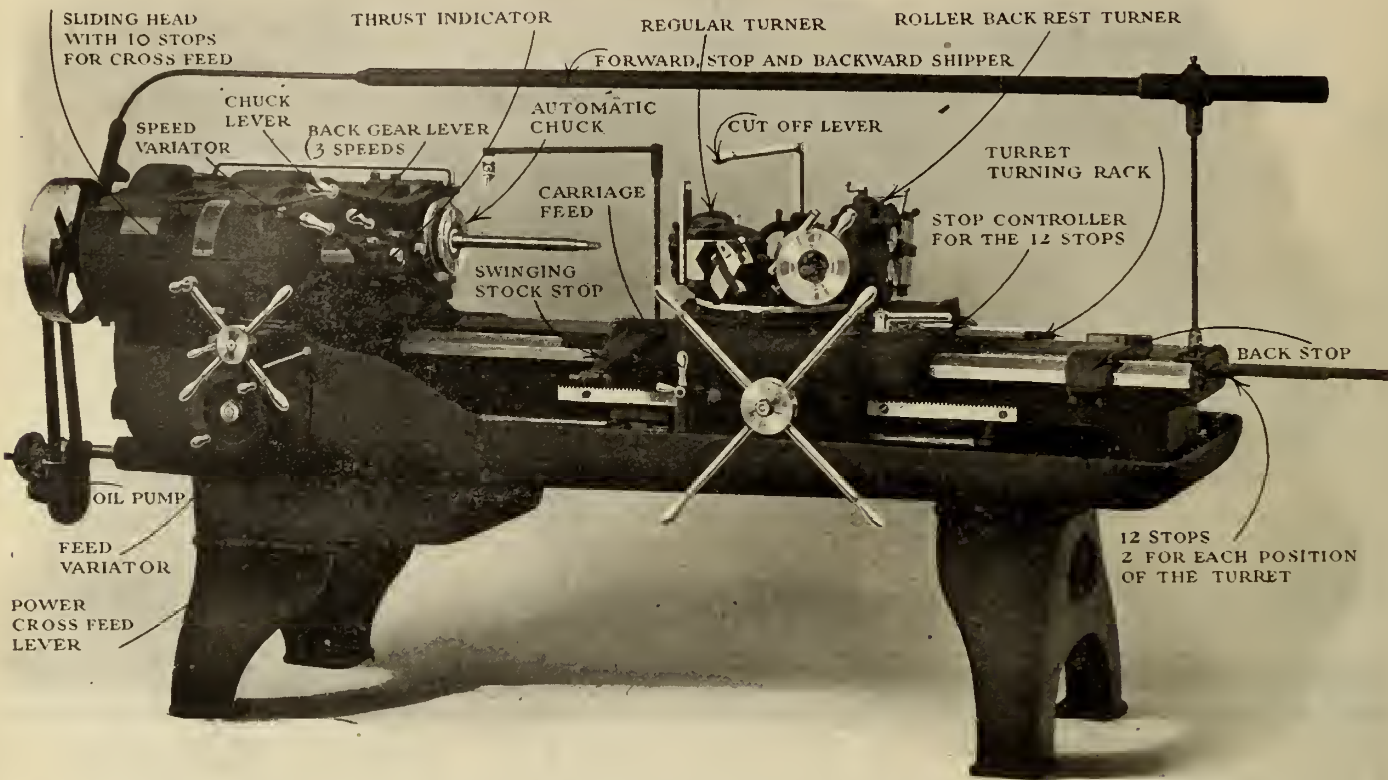

Our entire plant is devoted to the building of Flat Turret Lathes exclusively. We have been following this policy of sticking to one thing for over twelve years.

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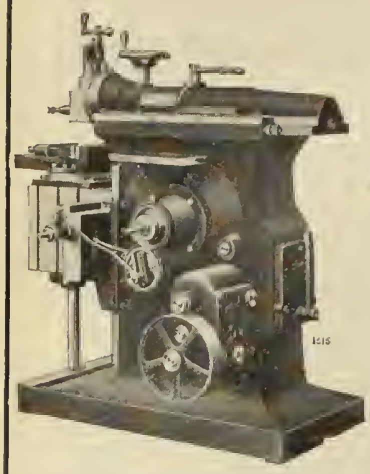

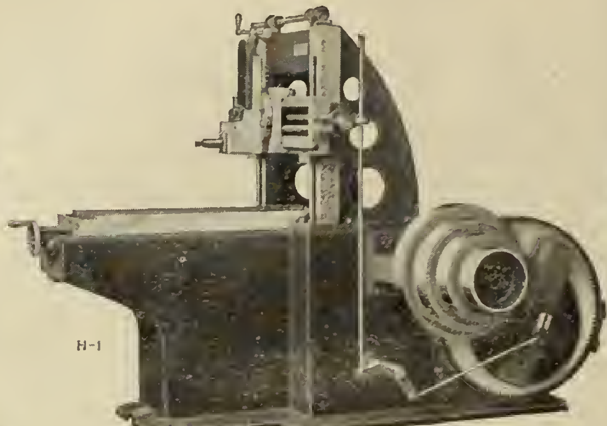

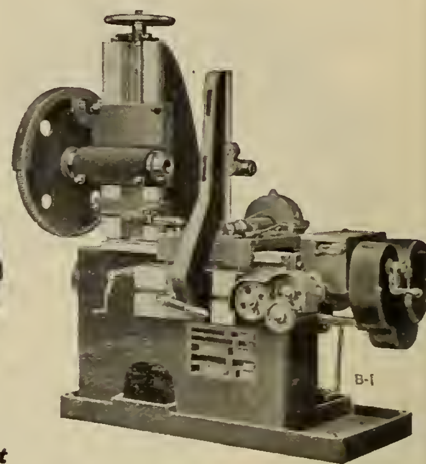

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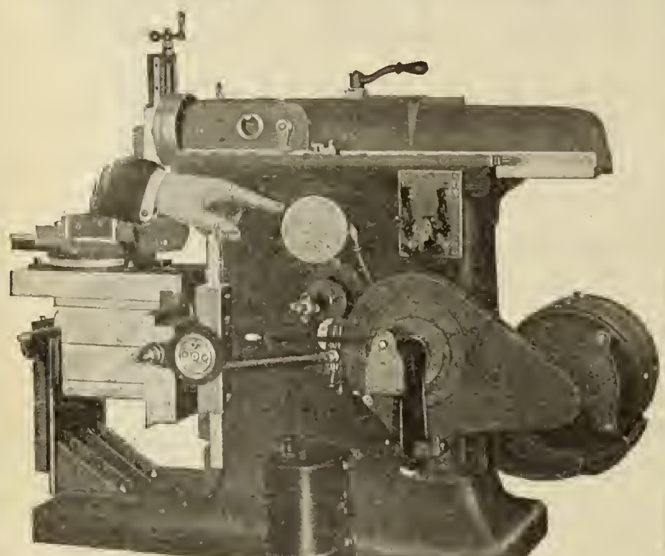

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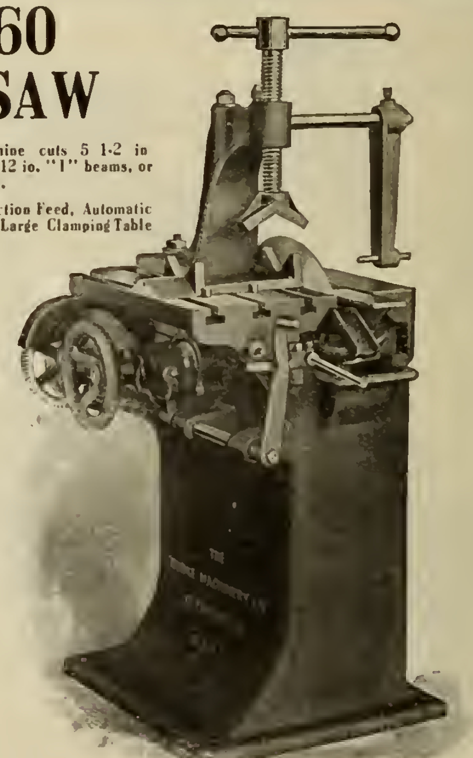
Power Friction Feed, Automatic Knockout, Large Clamping Table



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One new 7" Rhodes, hand or power

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One refitted No. 1½ American.
One refitted 12"x42" back-geared
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One refitted geared bench miller.

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One refitted 2" bolt cutter.
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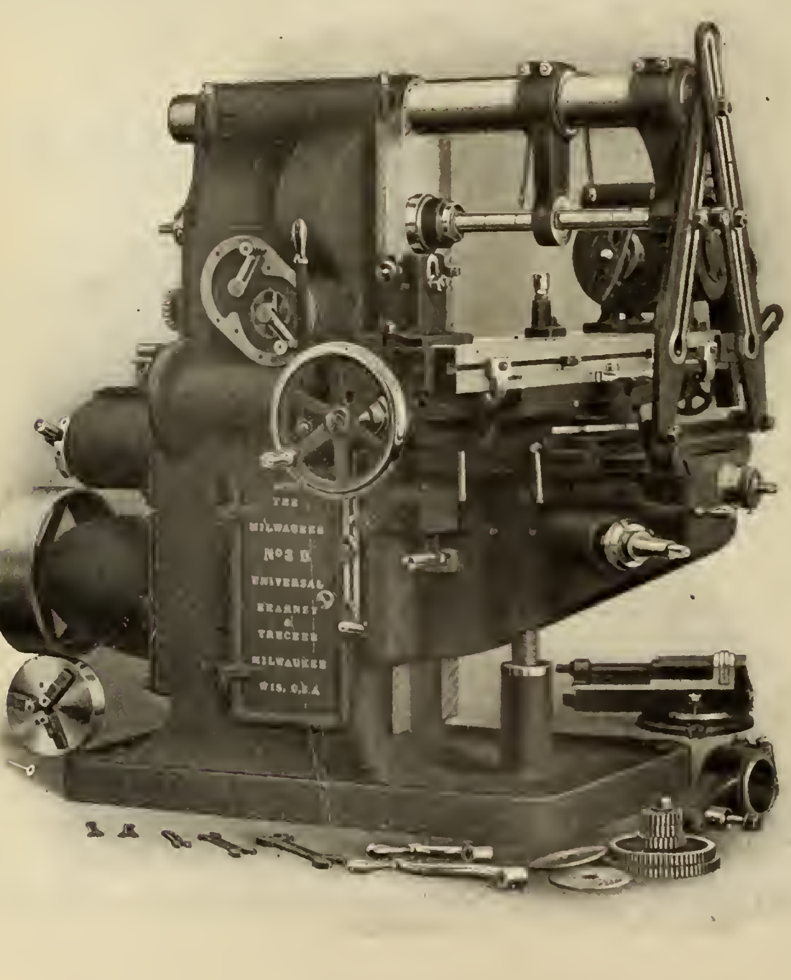

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No. 3B Universal Miller

is one of a line of Plain and Universal Milling Machines for heavy duty service having great weight and structural strength in comparison with range. Powerful drive through single pulley as shown or at right-angles. Electric drive applied without difficulty at any time. All gears and bearings automatically flooded with oil. Every machine equipped with pump for cooling and lubricating the cutters and with means provided for returning the cutting lubricant to its reservoir. Wide table for jig work with ample bearings for maintained accuracy. Accurate screws with sensitive graduated adjustments—all adjusting and feed screws have ball thrust bearings. Dividing wheel double the size usually used—accuracy equal to the best.

Let us send you more particulars.

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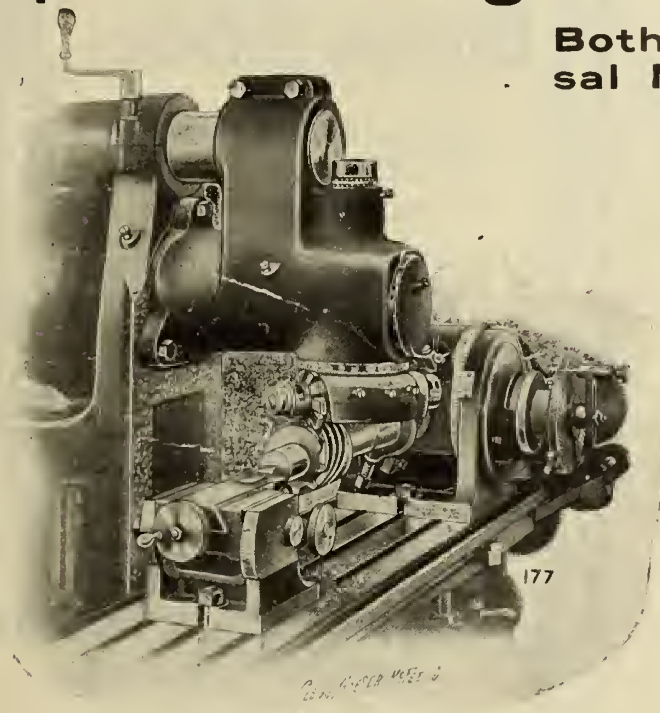
Spiral Cutting on Plain Millers



Both a Plain and a Universal Miller in one Machine

Cincinnati Plain Millers are arranged so that a Dividing Head or similar attachment can be geared to the lead screw for cutting spirals, the same as on Universal Machines. Since the tables of Plain Millers cannot be set at an angle, our Spiral Milling Attachment is needed to complete the equipment. It will mill spirals up to about 70 degrees and as large as the Dividing Head will swing. (On the No. 3 Machine it will cut 3 pitch in steel with ease.)

This gives you BOTH A PLAIN AND UNIVERSAL MILLER IN ONE MACHINE. This Spiral Attachment is also valuable for use on standard Universal Millers for cutting spirals having angles wider than the angle to which the table can be set.

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To Sharpen Formed Cutters With Patent Relieved Teeth

such as gear cutters; convex and concave cutters of this same class; all very simply, quickly and correctly, you will find it profitable to use a

Cincinnati Universal Cutter and Tool Grinder.

It will sharpen any other shape or style of cutter just as simply. That's the sort of work for which it is designed, and it handles it quicker and better than any other Grinder made. Let us send you proofs of this.

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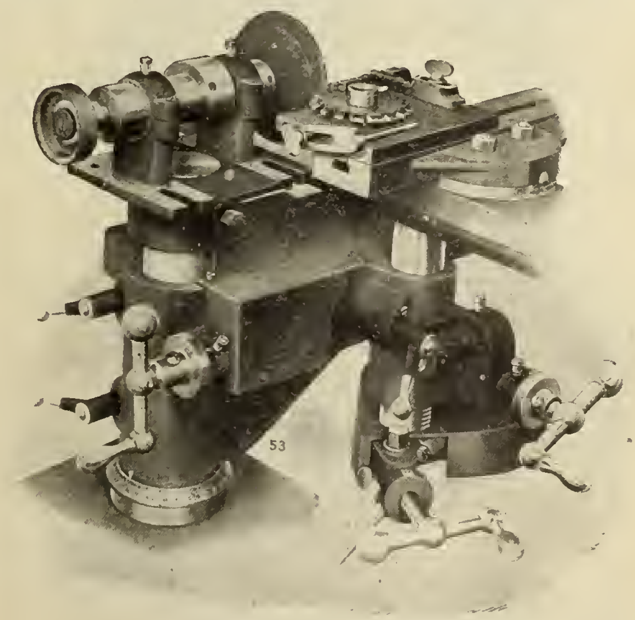
Treatise on Sharpening and Grinding



SHARPENING A GEAR CUTTER.

The Cincinnati Milling Machine Company,

CINCINNATI, OHIO, U.S.A.

Canada Agent—H. W. PETRIE, Ltd., Toronto, Montreal and Vancouver.

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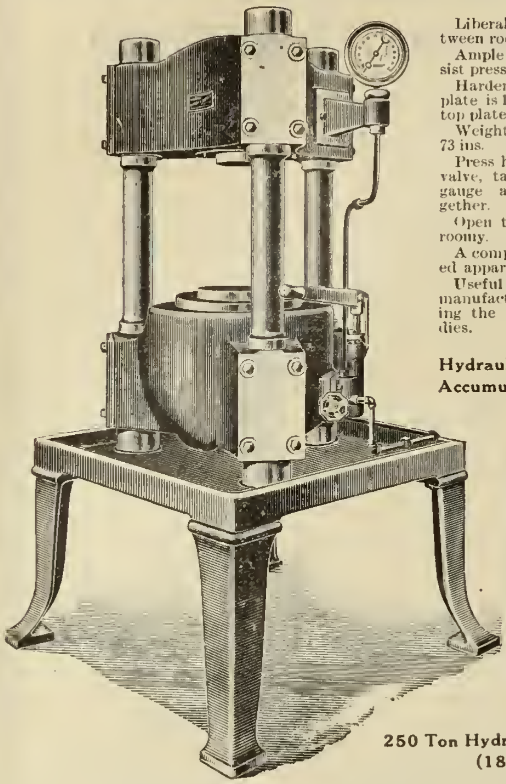

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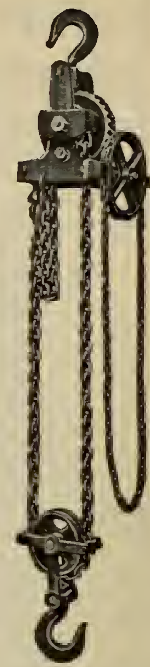

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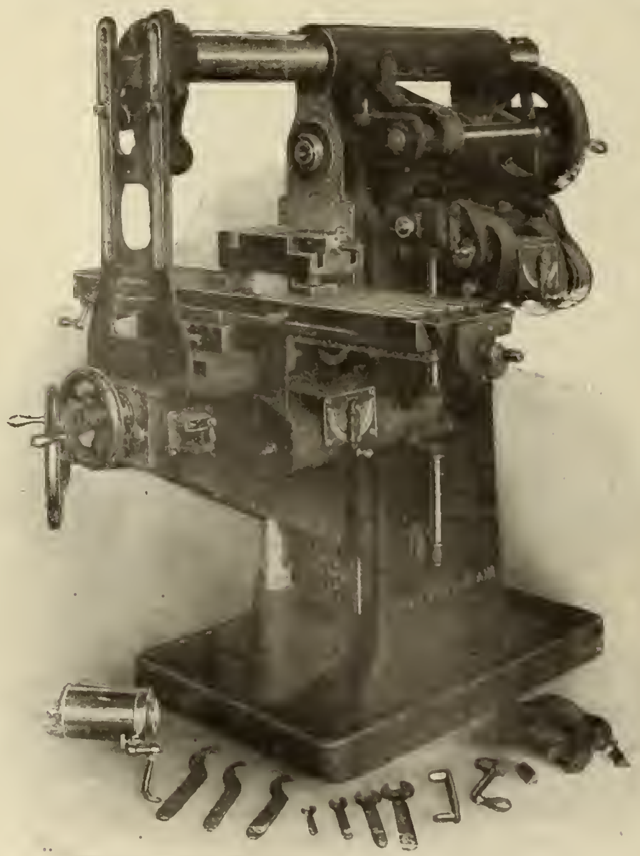

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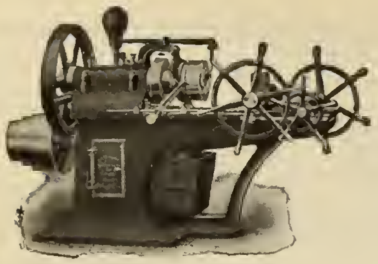

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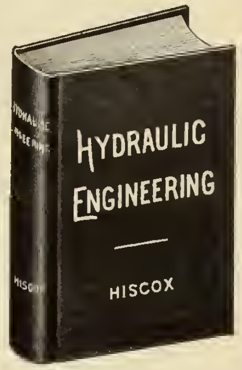

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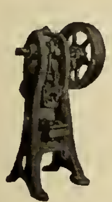

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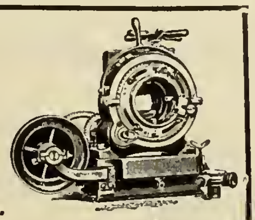

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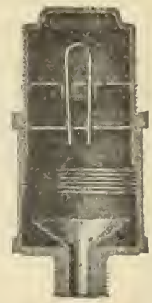

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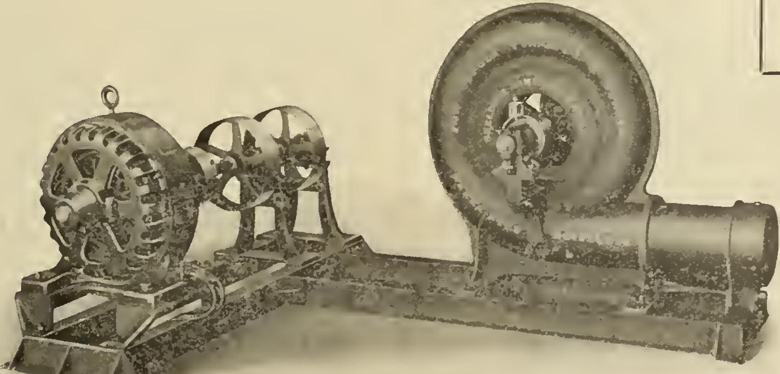

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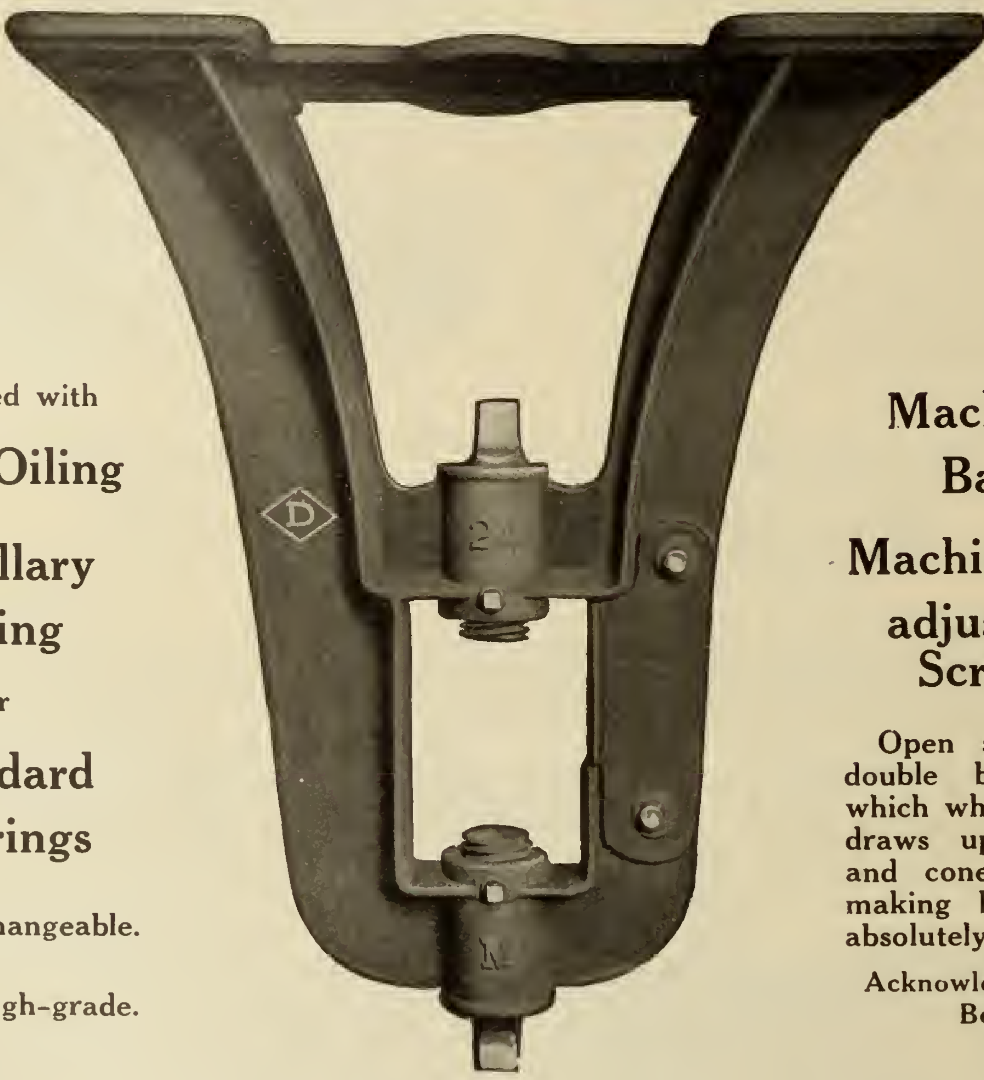

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New Shops of Intercolonial Railway at Moncton, N.B.*

Layout of Shops for Construction of I.C.R. Passenger and Freight Cars and Locomotives—Modern Power House Equipment—Gas Producer Power.

By C. F. BRISTOL.

The new shops of the Intercolonial Railway are located about a mile from Moncton Station, on the main line to Montreal. The site is on a plateau, about sixty feet above sea level, and although nearly flat, slopes gently to the southward in the direction of a small creek. Two main sidings, with numerous branches and spurs, facilitate shunting and render ready access to all buildings and yards.

The two passenger car shops are long and narrow, and so designed that cars may be placed transversely in each shop. These two buildings are parallel to each other and at right angles to the main line, with eighteen tracks in each. Cars may be readily transferred from any track in one shop to any track in the other by means of the electric transfer table between the two shops.

The stores and office building, power house, producer gas house, freight car shop, planing mill, lumber shed, and dry kiln are all laid out parallel to the main line of the railway, and are all served by side tracks. The planing mill is situated convenient to the passenger car shop and freight car shop.

The locomotive shops comprise the machine shop and annex, boiler shop, boiler erecting shop, engine erecting shop, and smith shop, all under one roof. The four latter shops are parallel to the main line, but at right angles to the machine shop.

A notable feature in connection with the engine erecting shop is the arrangement of the pits. The main pit runs almost the entire length of the shop, while the track is continued across the machine and passenger car shops into the paint shop, where locomotives may be painted should the erecting shop be crowded. The side pits are all laid at an oblique angle to the main pit, and this arrangement provides greater facilities for stripping and repairing engines.

The foundations rest on firm, dry, red clay. The pressure on the clay under the column footings and foundations was not allowed to exceed three tons per square foot. The foundations are of 1-3-5 concrete, with a six-inch batter on each face, and wherever the load is concentrated, as in the case of side columns, the width of the foundation is increased proportionately. The column footings are in the form of truncated pyramids.

Freight Car Shops.

This building is 134' 8" by 362'. Two rows of columns divide the shop into three bays, each 44' wide, and each containing two tracks through the entire length of the shop. In addition to these there are several narrow gauge tracks for small trucks.

The first wall course is 4' high by 24" thick on the ends, and 12" on the sides, this being increased to 20" at the side columns or pilasters. The upper outside edge of this first course has a 4" bevel running completely around the building. Expansion joints divide the wall into sections of 40'. On the sides, with 20' centres, extending from the first wall course to the roof, are the concrete pilasters, 4' 8" wide and 16" thick, with a small projection on each side which serves as a casing for the window frames. The space between the pilasters is entirely glass, except a strip 2' 3" wide, which is made up of 2"x4" spruce studding, covered on both sides with expanded metal lath and plastered with Portland cement mortar.

The centre columns are made up of two 8" channels held together by riveted lattice work, while steel trusses support the roof and form the monitor. The ends of each row of purlins are firmly imbedded in the end walls, while the two outside rows are completely imbedded in the concrete cornice. The outside vertical members of the trusses and monitor are imbedded in the concrete pilaster.

The roof slab consists of cinder concrete, 1-2-4 mix. The slab forms a knee on each side of the "I" beam purlins, and completely covers the upper flange and half of the web, thus giving them lateral support.

The reinforcement in the roof slab is electrically-welded wire cloth, 10"x4" mesh. The transverse wires are about ⅜" diameter, and the longitudinal wires about ⅛" diameter. This reinforcement is arranged so as to come ½" from the bottom of the slab at the centre of the span between the purlins, and ½" from the top of the slab at a point over the purlins. The bottom plane of the concrete slab is ½" below the plane of the top flanges of the purlins.

A thin layer of cement mortar is spread over the cinder slab to cover up the sharp projections, and over this a thin layer of pitch. Three plys of roofing felt are laid longitudinally, then hot pitch poured thereon, and the whole covered with a layer of gravel. At the edge of the roof the felt is well nailed to wooden strips imbedded in the cornice. The weight of the gravel and the

Interior of Passenger Car Shop.

*Abstract of paper read before the Can. Soc. C.E., at Montreal.

adhesion of the pitch securely holds the felt to the roof, and obviate the use of transverse nailing strips.

The monitor, 44' wide and 8' high, with continuous side lights, pivoted, extends the full length of the shop. The vertical members of the monitor truss are imbedded in small concrete columns similar in shape to the large side columns. Two rows of skylights on each side of the roof, with galvanized iron frame, on a 6" concrete wall 2' high, furnish additional light.

Interior of Freight Car Shop.

The planing mill is 81' 10"x202' 8", and is constructed practically the same as the freight car repair shop, except that outside steel columns are imbedded in concrete side columns, and that the monitor only comes within twenty feet of the ends of the building. Hence, the trusses at these points were designed to carry the monitor end walls. The steel columns were set up first and well guyed, then the trusses were rivetted in position and the purlins laid. No anchor bolts were used to hold the columns, as the forms were built around them to form the concrete pilaster. The cornice forms were next placed, and the column and cornice forms were filled with concrete in one operation.

Passenger Car and Paint Shops.

Each of these shops is 361' 8"x100'. The cabinet shop is elevated half a story in one end of the passenger car shop, on what is termed the mezzanine floor. In the car paint shop, on a similar floor, are the upholstery and varnish rooms. These buildings are constructed entirely of reinforced concrete, and being exactly similar, the same forms were used for both.

In the first wall course, which is 16" thick, with the upper outside edge bevelled, both horizontal and vertical reinforcement is used, consisting of ⅜" square steel rods. The vertical rods project about 6", ensuring a firm bond with the next course. The balance of the wall is 12" thick, and is almost all in the form of wall columns, with interstices for windows and doors, 60 per cent. of the wall area being of glass. The reinforcement in these wall columns consists of ⅜" round and ½" square bars, placed horizontally and vertically, and all wired together to form a coarse mesh.

The window lintels, 6" thick by 2' high and 12' long, have two ⅜" square twisted steel bars 20' long laid near the bottom, and two ⅜" round bars each 20' long, one in the centre and the other near the top. These bars extend 4' each way into the side wall columns so that they are securely fixed. The door lintels are smaller but of practically the same construction.

The mezzanine floor in the south end of each building is supported by a transverse girder resting on four columns, and a number of secondary beams at right angles to the girder. The secondary beams are carried by the transverse girder and the end wall column, while the 4" floor slab is taken as the flange of the beams. ⅜" square twisted steel bars, 20' long, and laid with 12" centres, constitute the slab reinforcement, and are placed about ½" above the bottom of the slab. The reinforcement in the beams and girder is similar to that used in the roof girders and beams.

The roof is carried by six longitudinal rows of columns, including the side wall columns. The rows of columns are 20' between centres, while the columns in each row are 18' apart, centre to centre. Each transverse row of columns carries a continuous roof girder, and the girders carry secondary beams spaced 6' 4" apart and at right angles to the girders. The 3" roof slab rests on the top of the beams and girders, and is figured as one piece with them, serving as the flange. Where the continuity of the secondary beams running longitudinally is broken by openings for the skylights, the beams project about 2' 6" from the girder in the form of short cantilevers, which support the skylight walls.

The concrete for the foundation, column footings and lower portions of the wall was mixed in the proportion of one part of cement, two of sand, and six of gravel; for the interior columns, there was used one part cement, one part sand, and four parts gravel, which had to pass a ¾" screen, but five parts of gravel were used for the wall columns, beams, girders, and roof slab. A richer concrete was used in the centre columns in order to give the greater strength necessary. All the concrete was "wet mix" and thoroughly tamped. The tamping rod consisted of a piece of gas pipe in one end of which a thin steel blade about five inches wide was welded. This blade was always shoved down into the concrete, close to the form. By this means all the stones in the concrete were pushed back from the faces of the forms, permitting the fine sand,

Exterior of Planing Mill.

etc., to form the outside surface. This tamping always resulted in uniform smooth surfaces when well done. Of course, the 3" roof slab could not be tamped in this way, but it was well

stirred by the shovels and straight edges run over the surface and the rough places smoothed off with a float.

The reinforcement in the girders consists of four twisted steel bars ¾" square, as shown on drawing (Fig. 3), extending across the span between each pair of columns and lapping about 1' with the reinforcement in the next span. Six ⅜" square stirrups were wired to the four twisted bars at each end, so that the complete reinforcement for each span could be easily handled and laid in position in one piece. In the secondary beams, the reinforcement is made up of three ⅝" square twisted steel bars and wired together with the stirrups. At an angle of 45 degrees two ⅝" square twisted bars 5' long are thrust down into the knee brace on each side of the column, while three ⅞" square twisted rods are laid in the slab over each column.

The slab reinforcement on the passenger car shop consists of No. 10 gauge 3" mesh expanded metal, while on the passenger car paint shop ⅜" square twisted rods are laid transversely with 12" centres.

The first floor and basement of the stores and office building is intended for the local and general stores department, and the second storey, over the western half, will be utilized for the offices of the stores department and superintendent of motive power.

Cement Test.

A slag cement was used in all the concrete below the ground line. The important factor in favor of this cement from a contractor's standpoint was that it cost about $1.00 per barrel less than the Portland cement, f.o.b. cars Moncton.

An average taken from a month's tests is as follows: Assuming 500 lbs. per square inch as the standard tensile strength of a good Portland cement, this slag cement gave an average result of about 58 per cent. at 7 days and at 28 days about 85 per cent. of the standard, although some individual tests ran very close to the 500 lbs. per square inch. When given a longer period than 28 days in which to set the tensile strength indicates a still greater increase, but for want of time very few tests were made on briquettes over 28 days old.

Locomotive Shops.

The locomotive plant includes five shops, viz.:

The machine shop, 131' 6"x408'x36' high, divided into two bays by a centre line of columns, each bay being served with an overhead electric traveling crane of ten tons capacity. This shop has an annex 44'x408'.

The smith shop, at right angles to the machine shop, is 75'x375'x37' high. Water gas will be used for the different furnaces. Jib cranes are to be placed conveniently near the several fires and furnaces, while a track through the centre of the shop permits the handling of heavy work by means of trucks.

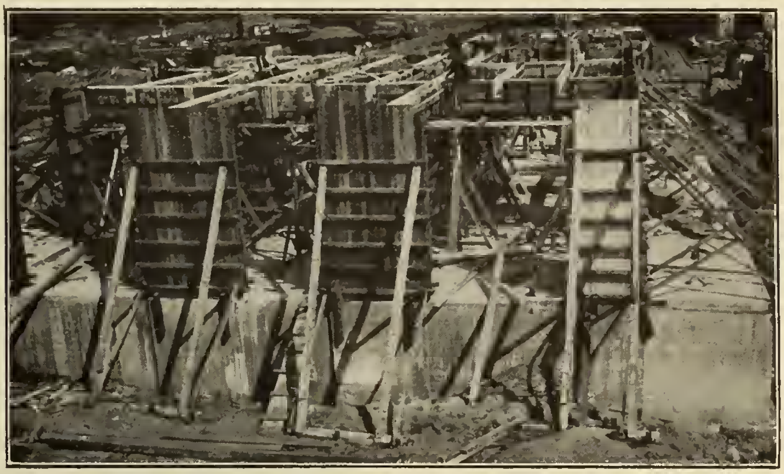
The engine erecting shop, separated from the smith shop by a partition, is 80'x375'x50' high. Two 60-ton electric traveling cranes are to be installed for moving and placing locomotives. Through the centre runs a surface track with a shallow concrete pit. On each side of this central track are eight side tracks with pits arranged herring-bone style. These side tracks are designed to accommodate engines requiring heavy repairs, and this form of layout provides ample space for overhauling. This leaves the central track free for light repair work, and obviates the necessity of lifting one engine over another.

In the smith shop the ground is brought to grade and filled with selected filling, rolled, and rammed. The floor in the engine erecting shop consists of 3" hemlock plank spiked to 4"x6" sills, spaced 2' 9" centres, and resting upon a 4" layer of concrete. The boiler shop has 3" hemlock plank on 6"x6" cedar sills laid 3' apart, while in the machine shop 2" hemlock plank are nailed to 3"x3" nailing strips resting upon a 3½" layer of concrete.

The roof slab is composed of four inches of cinder concrete, reinforced by ⅜" square twisted steel rods 12" centre to centre. On the upper sides of all skylights situated on the slope of the roof, the slab is raised to form a cricket to shed water freely.

Side lights comprise a large percentage of the outer wall area, while numerous skylights supply additional light.

The machine shop is well under way, but beyond the foundations, nothing has been done to the balance of the locomotive shops, which will not be completed for some months.



Forms for Second Storey, Stores and Office Building.

Between the engine erecting shop and boiler shop walls is a space 25' wide, which permits of additional side lights. The boiler shop is 100'x375', divided into two bays by a row of columns down the centre. The bay intended for boiler erection is 44' high, and the west end of it contains the rivetting tower, 25' long by 75' high. A 35-ton electric traveling crane is to be installed in this bay, and a 30-ton crane in the rivetting tower to serve the bull rivetter. The tool bay is served by means of a 10-ton electric traveling crane, which traverses the entire length of the shop. In addition to this, jib cranes are to be placed convenient to the different tools.

These buildings are of structural steel framing. The columns rest on concrete pedestals spaced 25' centre to centre throughout. The side walls, for a distance of 5' above the ground, are of concrete, and at each exterior column, extending up to the cornice, is concrete pilaster. The 6" partitions between the various shops are of reinforced concrete.

Power House.

The power house is built on the same principle as the planing mill, viz.: Steel columns imbedded in concrete pilaster, and steel trusses to support the roof. The engine room and boiler room are each 69'x100', and separated by a reinforced concrete wall.

The floor in the engine room consists of ⅞" maple flooring, overlying 2" hemlock planks spiked to 3"x3" nailing strips imbedded in a 3½" layer of concrete.

In the boiler room the floor is of tar macadam, laid on a 6" course of gravel, well rammed and rolled.

The boiler equipment consists of four Babcock & Wilcox water tube boilers of 250 h.p. each, arranged in two batteries, while the necessary space is reserved for a third battery. Fuel economizers, and a feed water heater and pump

are installed to take care of the feed water. An induced draft plant forms part of the equipment, also a 1,000-gallon U.W. pump. In this room, a fan, direct connected to an auxiliary engine, supplied the heat required in the freight car shop.

The coal bins are arranged along the side of the building in front of the boilers.

The engine and generator equipment is as follows: Two horizontal double-acting gas engines, normal rating 500 B. H.P. each, adapted to drive two 300 K.W. direct-connected, sixty-cycle A.C. generators. These generators are three-phase, 1,500 R.P.M., and 220 volts. In addition to these machines there will be two 70 K.W.D.C. belt-driven generators of 250 volts and 875 R.P.M.

The gas engines are driven by producer gas, which is to be manufactured in the producer gas house, situated near the power house. The gas for the furnaces in the smith shop will be water gas, also manufactured in the gas house. The gas generators will convert continuously about 1,000 pounds of coal per hour, generating therefrom about 18 cubic feet of water gas for the furnaces, and about 55 cubic feet of producer gas for the engines.

The shops are heated by the hot blast system, using exhaust steam from the auxiliary engines and pumps, supplemented by live steam from the boilers. Fans, direct connected with engines, force the hot air through concrete conduits, furnished with risers in the walls. These risers discharge close to the floor near the windows.

Construction Plant.

The machinery or plant consists of eight mixers, both yard and half-yard sizes, located convenient to the various buildings. Where the concrete had to be elevated the mixer discharged into a bucket which was hoisted up an elevator and dumped automatically into a hopper, from which the mix could be taken by barrows. Both the mixers and hoisting machinery were driven by small donkey engines. Two gas engines were also used, one for twisting the steel and the other for pumping.

Two derricks, with 60' booms, and one with a 90' boom, were used for steel erection, while a traveling yard crane, with a 40' boom, was used for unloading and other purposes.

Mr. W. A. Bowden, of the Department of Railways and Canals, is the designing engineer of all these buildings.

The economic handling of material between the various shops was the prime factor in determining their location in relation to each other, and they are so placed as to enable any shop to be enlarged without interfering with the future extension of any of the others.

Hot Galvanizing: The Process in a Canadian Plant

Galvnnizing in Plant of Ontario Wind Engine and Pump Co. — Pickling, Drying and Dipping Process—Large Investment and Quick Depreciation

There are three processes of galvanizing in commercial use at the present time, the hot process, electro-galvanizing and sheradizing

In the last issue was an article on electro-galvanizing some time ago an article on sheradizing appeared in Canadian Machinery, and this article will deal with hot galvanizing, as carried on in the galvanizing plant of the Ontario Wind Engine & Pump Co., Toronto.

The accompanying illustration is a view of the galvanizing room, showing the galvanizing pots, and men at work dipping castings. Before arriving at this room, however, all work is thoroughly cleaned in acid baths, and with some few exceptions the work is thoroughly dried. The reason for the thorough drying is that if any water still clung to the work when it is dipped into the pot of hot spelter, steam would be generated and an explosion take place, the violence of which would depend upon the amount of water present.

This cleaning process is called pickling. The work is first placed in a bath of weak sulphuric acid solution, which removes all grease, dirt and other foreign substances. From this bath it is transferred to a bath of weak muriatic acid solution, which further cleans it and prepares it for the galvanizing bath. After leaving the cleaning room the work, with the exception of such articles as metallic shingles, goes to the drying room, where it is dried upon racks over steam pipes. After being thoroughly dried the work goes to the dipping room.

The galvanizing pots in this plant are two in number, which are well shown in the illustration. These pots come from England and are made of one-inch steel without seam. They last only about one year and constitute one of the chief items of expense in hot galvanizing. The larger of these pots is 23 feet long, 3 feet wide at one end, and 1½ feet at the other. This pot contains about 15 tons of spelter, which at five cents per pound means an investment of $1,500 in spelter alone for that pot. The smaller pot is 6 feet long, 3½ feet wide and contains 9 tons of metal, meaning an investment of nearly $1,000.

The zinc is placed in the pots in the form of zinc spelter, in the form of slabs. It melts at a temperature of 780 degrees Fahr., and it is not safe to let it get above 860 degrees Fahr. As may be seen, the pots are enclosed in brick setting, and they are heated from below with gas coke.

Galvanizing Plant, Showing Pots.

The illustration shows the manner of dipping the work into the spelter. At one end of each tank sal ammoniac is thrown on top of the spelter, through which the work is dipped.

The class of material galvanized in this plant is very varied. Their own windmill and tank work forms a chief item, besides which they do all kinds of job work, castings of all kinds, wire netting, plates, screws, nails, bolts, etc.

Consideration of Methods of Locating Holes in Jig Work

Methods Adopted with Restricted Apparatus—The Button Method for Accurate Results — Special Machines for Such Work.

By JOHN EDGAR

The use of jigs and the interchangeable system of manufacturing machine parts have done away with the little chance that the ordinary machinist had of exercising his skill in laying out of the work. Now this skill must be turned in other channels, such as the proper handling of the jigs and fixtures that are provided for the performance of the numerous operations.

Before the introduction of jigs each part was fitted to its mating piece, with little regard to dimensions, so that it would perform its function as a part of the mechanism as a whole. It is obvious that this called for little accuracy compared to such as is obtained to-day by the use of jigs. Now each part is made to the proper dimension to within very narrow limits.

The machinist's method of laying out the work and locating the holes in the work with scale, divider and prick punch must give way to the more refined methods of the toolmakers when we wish to work to the narrow limits now demanded. In this article we will describe some of the methods used by the toolmaker in locating the holes in drill and boring jigs.

To Locate Holes in Jig With Restricted Apparatus.

First we will take a case such as might be met in ordinary practice and design a jig and describe the methods of locating the holes by means of such apparatus as is available in any machine shop, no matter how small the equipment may be.

The work is shown in Fig. 1, which is dimensioned with such figures as are needed to locate the holes as well as to give their size. This piece, as will be seen, has three holes, the location of which are dependent on the machined surface underneath. This surface is used to locate it properly with its mating part. This surface will then be used to locate the piece properly in the jig.

If we were to set a jig designer to work to design a jig for this job he would probably provide a box jig made of one piece casting with a cover or hinged strap, but as we are restricted in this case we will make our jig out of scrap. It must necessarily be a built-up jig under such circumstances. We begin with a bottom plate and plane this so as to match the machined surface of the casting. Around this we build up the three sides and bolt on a cover plate as shown in Fig. 2. This figure shows the jig in the position when the work is being placed in it; and it is obvious that the jig is turned other side up resting upon the four feet during the drilling.

Besides the locating edge of the bottom plate there is provided a screw "a," which positions the casting parallel with the locating shoulder. The three binding screws "b" are shown and are brought up with slight pressure against the casting before the clamping screw "c" is tightened, which, being located slightly off the centre of the boss, tends to crowd the work down against the screw "a" as well as against the locating shoulder. After the work has been forced into proper position the screws "b" are brought up tight. The work is shown by dot and dash lines in place in the jig, Fig. 2. The cover plate is provided with clearance holes opposite the drill bushings in the bottom plate to allow the chips to fall through and also as clearance for the drill.

In making this jig the first work is that of providing the bottom plate and the planing of it to the required shape to properly locate the work as well as to provide means for bolting the side walls to. After this has been furnished and the process of planing finished, which need not be gone into here, we may proceed with the work of locating the holes for the bushings in this plate.

A sketch of the bottom plate is shown in Fig. 3. All dimensions are

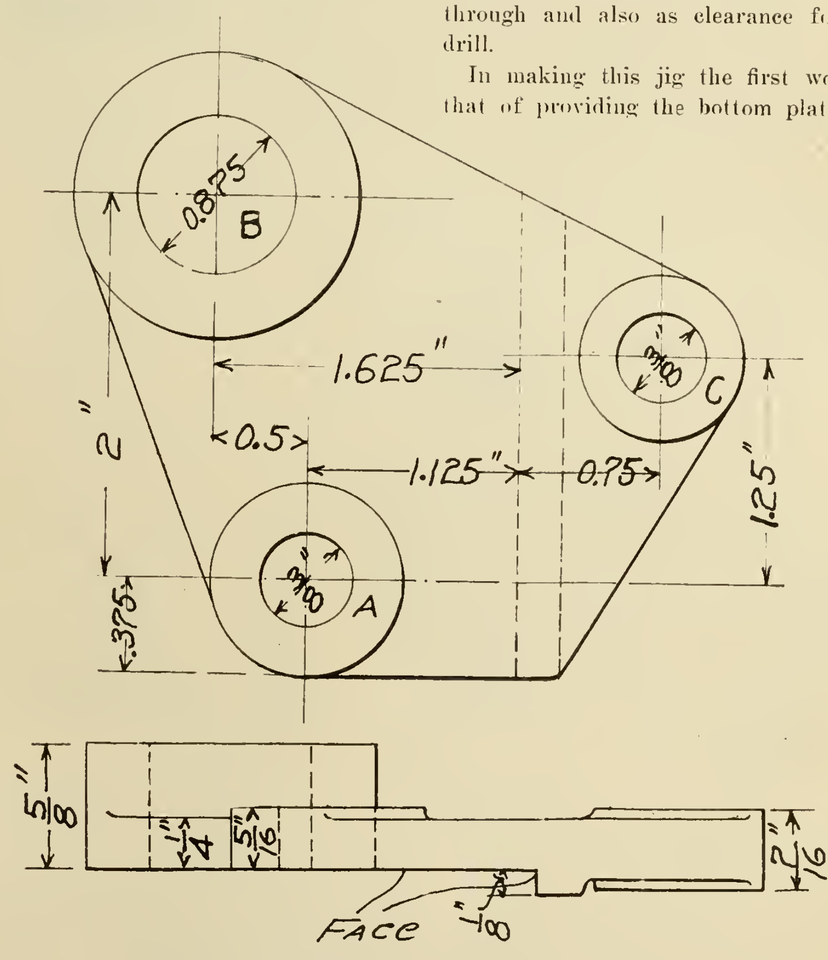


Fig. 1—Drawing of Piece to be Drilled.

taken from the bottom edge "c" and the locating shoulder "d." These two edges being chosen as reference surfaces for reasons that are very evident from an inspection of Fig. 2. The dimensions are calculated from Fig. 1. The distance of the first hole from the edge "c" being arbitrary and dependent only on the size of the plate and the desired location of the work. We might let the work come up against the inner wall of the jig as a locating point instead of using a screw as in Fig. 2, but the objection to this would be the liability of chips and dirt lodging in the corner and preventing the proper setting of the work. By letting the locating edge of the piece come only within a quarter of an inch of the wall we allow room for any chips that may be lodged in the jig without danger of dislocating the work in proper relation to the bushings. This would bring the centre of hole A five-eights or 0.625 inch from the reference edge "c" and, by the drawing, Fig. 1, one and one-eighth, or 1,125 inches from the locating shoulder "d." With the hermaphrodite caliper and scale lay out the centre of this hole as closely as is possible by this means. By the same method lay out the centre of hole B at a distance of 2.625 inches and 1.625 inches from the edges "c" and "d" respectively. The hole C may also be laid out at a distance of 0.75 inch to the right of the shoulder and 1.875 inches from the lower edge "c." The dimensions for these centres are obtained by calculating from the drawing, Fig. 1, as the location of these, two holes are given as relating to the centre of the hole A, and the locating shoulder "d." With these centres drill and tap a hole for a quarter-inch screw. While the centres located by the above means may be fairly accurate in location they are not close enough for the purposes of the interchangeable system when dependence is placed upon their location alone for the alignment with relative parts in the other mechanism and should any dependence be placed upon their location the errors would be such as to make any parts so drilled useless. It is by the use of more refined methods that accuracy is obtained.

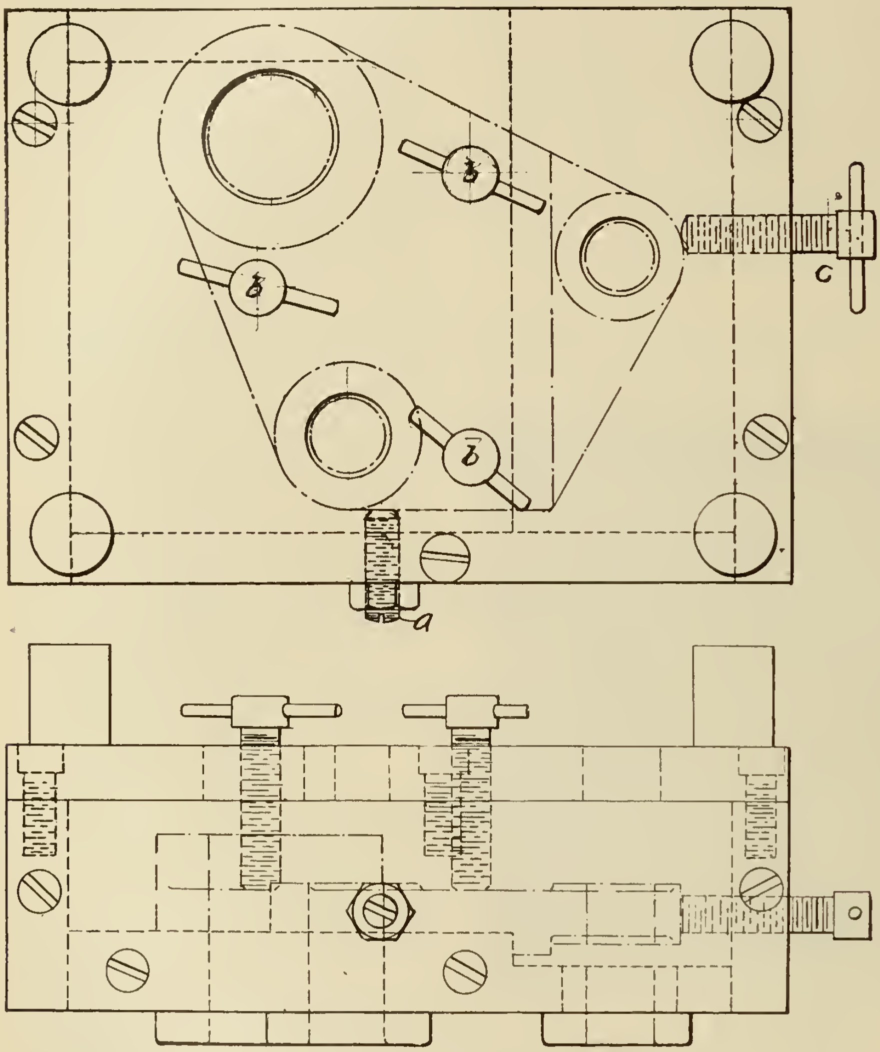


Fig. 2—The Jig.

The Button Method.

The most reliable method to use where accuracy is essential, and where the work is of a size that it is convenient to use, is the button method. Some of the finest and most accurate tool and jig work is done by employing this method. It is used to originate index plates for dividing engines. In fact, it is of universal use in locating holes from given points in all kinds of fine work from the most microscopic watchwork to the largest kind of tool work. Its application calls for no special apparatus that any average machinist cannot provide, and skill in its use is only a matter of patience and practice. When one is familiar with its principles it requires but little ingenuity to adapt it to the many different variations to which it lends itself.

The button is shown in Fig. 4. It is merely a bushing made of steel, preferably of tool steel and hardened. It must be accurately finished to a prescribed diameter and be faced true and smooth on both ends. The hole must be somewhat larger than the screw which is to hold it in position. The method of applying it to the plate is shown in section in Fig. 3. The washer that is shown under the head of the screw is also hardened and faced true and smooth. The under side of the head of the screw which is hardened must be true and polished. The necessity of having these surfaces smooth and polished will be evident when the method of their use is explained, as uneven surfaces would cause trouble.

In Fig. 3 the dotted lines are drawn to represent the button imposition and the dimensions from the outside of the bushing to the reference edges are given. Since the button is shown in section over the centre of the hole C we will start with that hole, but a start could have been made with either of the other two holes as there is little choice in this case, but there are cases in which it is obligatory that a start be made from a particular point.

To position the button for locating the hole C we must provide a three-eight-inch sizing block. Such a block may be made of any piece of flat stock which can be brought down to a thickness of 0.375 inch, the calipering being

done with micrometers. An end measuring rod 1.5 inches long must also be provided. Such a rod is shown in Fig. 5 and consists of ordinary pin wire or drill rod of a size which insures stiffness. This is cut off and filed to the required length, the calipering being done with micrometer caliper or with a veneer beam caliper if of a length too long for the former.

The button is put approximately in position and the screw brought down upon it with pressure to hold it in place, making it necessary to tap it lightly with a hammer or light mallet to shift its position. The sizing block is then placed in the space between the button and the shoulder "d" and is clamped in position with one edge resting against the shoulder. The plate may now be raised with the edge "c" resting on a surface plate and with the end measuring rod the button may be set at the proper distance from the reference edge "c" and at the same time at the proper distance from the shoulder "d" by bringing it into contact with the sizing block. The button is then clamped by further tightening of the screw, after which it should be tested again with the rod and block.

The plate is now taken to a lathe and strapped to the face plate so that the button will run true with the centre of the spindle.

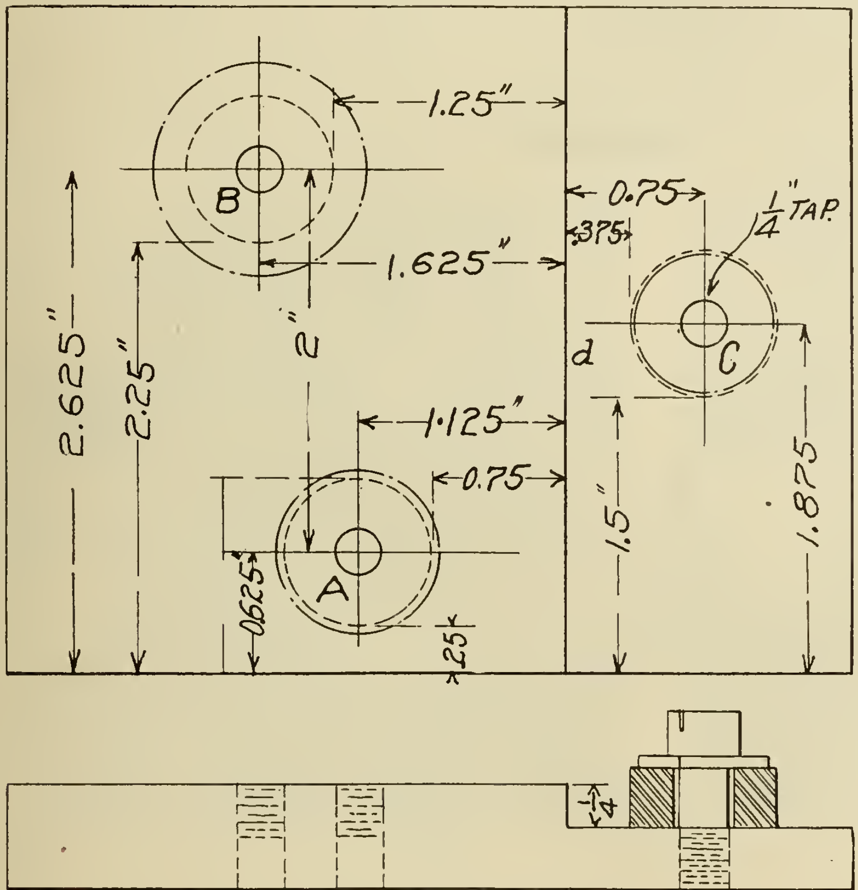


Fig. 3—Bottom Plate of Jig.

The truing up process is accomplished by means of a sensitive indicator. When the button runs true, the jig plate is securely clamped, the face plate and the button removed. The hole is then bored out to the size required by the bushing. These bushing holes are indicated in Fig. 3 by the dot and dash lines.

Positioning the button for hole A may be accomplished wholly by means of sizing blocks, as the distances are so short that rods would be difficult to handle. In this case a parallel or block may be clamped to the jig plate and butting against the shoulder "d" using the surface that projects above the surface of the plate to gauge from in locating the button from the shoulder, and by resting the plate on the edge "c" or by holding a block or parallel against this edge in locating it in the other direction. The former method is to be recommended, as the weight of the plate may be used to advantage.

In locating hole B the block may be clamped against the shoulder as before and the button may be trammed from the surface of the block and the surface upon which the plate rests, the plate resting on edge "c" as before. The holes A and B are bored out on the lathe in a manner similar to that employed in boring hole C.

The accuracy with which the buttons are positioned depends on the care with which the operations are carried out. With the same tools and apparatus no two men of average ability would obtain results that would check up. But it is different with skilled tool makers: given equal advantages, two men of skill can by this method, working from drawings, produce parts that will register within such narrow limits that the error is practically nothing.

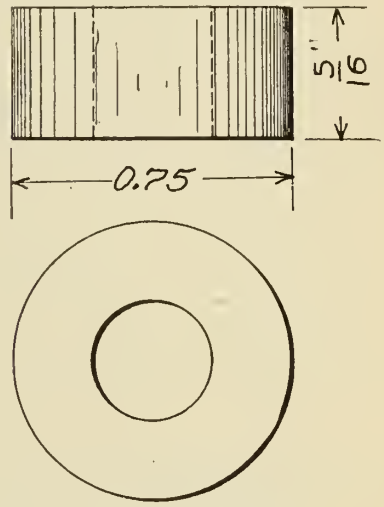


Fig. 4—The Button.

In handling the plate after the button has been positioned, care must be taken not to shift it by rough handling. Such a mishap as dropping it would obviously tend to cause a shifting of the button and would require testing before boring.

The holes should be of a size so that the bushing would require a slight driving to seat them.

The particular case treated above is necessarily a very simple and easy one to handle and while a great many jobs are encountered that are quite as easily done, there are many that from a casual examination would suggest the impossibility of using the button method in locating the holes. It needs, however, but a slight amount of ingenuity on the part of the jig maker to find a way about the job that will prove satisfactory.

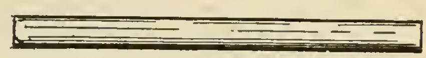


Fig. 5—End Measuring Rod.

It is quite obvious that the time necessary to properly locate a series of holes by this method is such that it would be too costly to perform the operation more than once in obtaining duplicates, so that even when the number of pieces is small it would be much cheaper to construct some sort of a

jig or fixture to locate the holes when duplicate work is desired.

Modification of Button Method.

A modification of the button method is shown in Fig. 6. It is here applied to a boring operation on a larger type of work, the work in this case being a boring jig with four holes for supporting bushings for the boring bars. One set of holes are bored to size and it is desired to locate the other set at a certain centre distance from them. To do this a straight round bar is provided and inserted in the holes, having one end project a couple of inches or so.

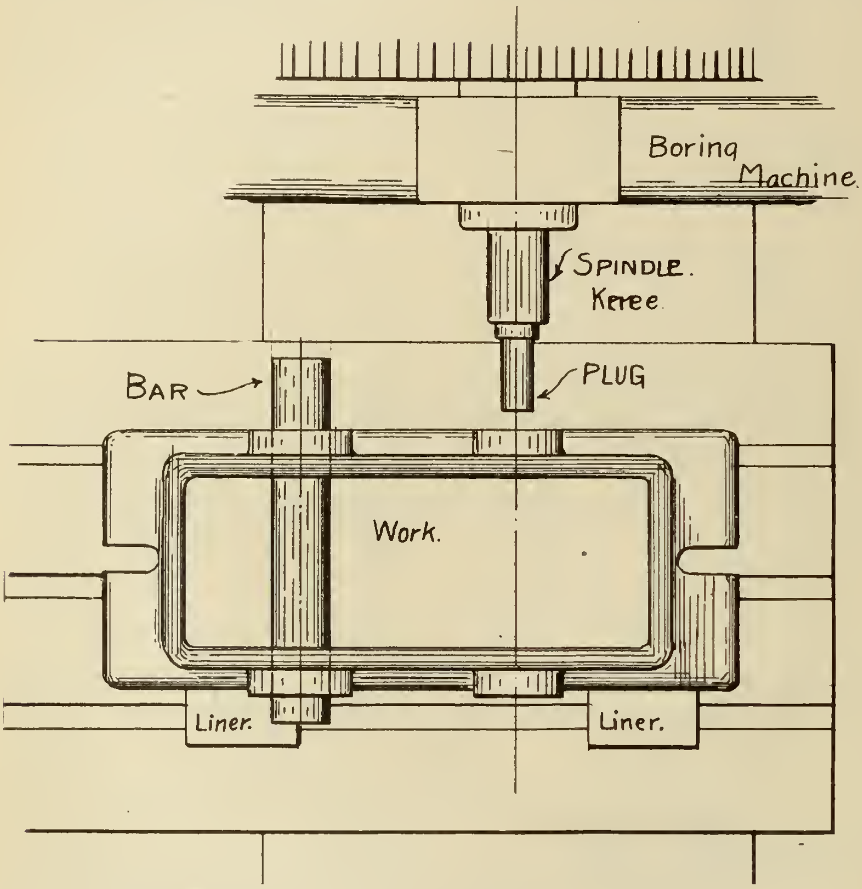


Fig. 6—Modification of Button Method Applied to Boring Jig.

In the spindle of the machine is shown a plug which runs true with the centre of the spindle. The proper centre distance between the bar and the spindle is obtained by either tramming with an end measuring rod or by calipering the distance from outside of the bar to the outside of the plug with a beam caliper. Should the height of the second hole be of a different height than the first, the setting of the latter may be done by tramming from the top of the table to the plug, the proper dimension being obtained from the position of the bar in relation to the top of the table. The sketch shows the work on a boring machine with a horizontal spindle, but the work could have been strapped to an angle plate on the drill press platen and the job done with but little more difficulty.

Other Methods and Special Machines.

Other methods of locating the holes in jig work are in use, but none is so reliable and so easily applied as the button method.

Special machines are built for this work and are provided with very accurate lead screws to which are fitted micrometer dials such as are used on the milling machine. In fact the milling machine has no rival for this work when up to the mark in condition, as the work can be moved in right angle directions and the measuring done by means of the micrometer dials attached to the screws.

The special machines designed for jig work are nearly all provided with vertical spindles and combine the accuracy of the milling machine with the easy handling qualities of the upright drill, a vertical spindle being preferred on account of the accessibility and the fact that the work is in plain sight. But not all cases are adapted to the vertical spindle machine. Such work as boring fixtures where holes through opposite walls of the fixture have to align are easily handled on a horizontal spindle machine, whereas on a vertical spindle the work would require blocking up, but for drill jigs the vertical spindle machine is much the handier.

In order to increase the accuracy of the results obtained by this direct method, that is, the movement of the work from one position to another at a prescribed distance, the table and saddle are fitted with vernier scales, in which case no dependence is placed upon the accuracy of the lead screw, it being used merely as a means of moving the table from one position to the other, the measurement being read directly from the scale, the sensitiveness of the reading being dependent on the vernier attachment, which may be made to read to one-thousandth or one-tenth of one-thousandth of the inch, as desired.

In some cases the locating of the holes in jigs is done by transferring the holes from a model to the jig. This is done where a model machine is made, and everything made to work satisfactorily, in which case it being desired to duplicate the various parts just as in the model, the transferring is done by clamping the model part to the jig plate and boring or drilling through the jig plate, using the holes in the model as a guide.

This method is used in small work such as typewriters, guns and electrical work.

In an article of this kind principles can only be described and the particular case used in explanation may appear simple to one who already has a good knowledge of the methods, but to the man or boy who has not had the facilities or chance to acquire knowledge of the methods of the toolmaker this may open the way to better things.

MACHINE KEYS.

Ques.—What is the practice in the manufacture of machine keys.

Ans.—The standard keys manufactured by the Standard Gauge Steel Co., Beaver Falls, Pa., is that the width of the key should be one-fourth of the diameter of the shaft but this may vary from one-sixth to one-fourth according to the size of the work, the depth in the hub should be one-third the thickness of the key for a straight key and three-fifths of the thickness of the large end of a taper key. For a taper key with one-inch thickness under the head, the head is 1⅝ ins. x 1 in., the depth of head 1⅛ in., the width of key 1 in. The standard taper key is made square under the head, thus the one we have taken as an example is 1 in. x 1 in. under the head and tapers ⅛-in. in 12 in.

Taper keys must fit on their tapered sides and should have a neat fit on their parallel sides, that is the top and bottom of the key must have a tight fit. For straight keys it will depend on the purpose for which they are used what part of the keys should be tight.

Improved High Power Horizontal and Vertical Millers

Designed and Built by the Cincinnati Milling Machine Company, Being the Development of an All-Geared Spindle Drive Arrangement,

In designing these millers the Cincinnati Milling Machine Company started with the fixed specification, the range of table travels of the machine. The intention was to develop a class of machines which should be sold on the basis of production; that is, the size of cut which would be capable of taking in machinery steel. Take for example, the No. 4 plain miller. This machine has a travel of 42 inches. Past experience led them to decide that a machine of this size should have a capacity to use the full power of a 10 h.p. motor. The standard cut which forms the starting point of these machines, using a quickest possible time. The basis of the complete design is the constant speed belt-driven machine with the driving shaft parallel with the spindle, the feed box being driven from the constant speed shaft and fitted with an index plate giving the feed in inches per minute. By the changing of a bracket, this is converted into a machine of the same style but having a right angle drive with the spindle. By substituting a simpler driving-gear box, the machine is converted into a cone-pulley machine in which the feeds are driven from the spindle, but with no change in the feed box itself. Substituting a different feed index plate, to 6 give the reader an idea of the flexibility of construction.

Figs. 1 and 2 are constant-speed driven horizontal machines with inches per minute feed, Fig. 1 being parallel drive and Fig. 2 right-angle drive. Fig. 3 is a constant speed motor-driven machine and Fig. 4 has a variable speed motor drive. Figs. 5 and 6 are cone-driven machines feeding in thousandths per revolution, being parallel and right-angle drive respectively. The operator has the choice of feeds in inches per minute or thousandths per revolution on all constant speed or motor-driven millers. Fig. 7 illustrates the motor drive

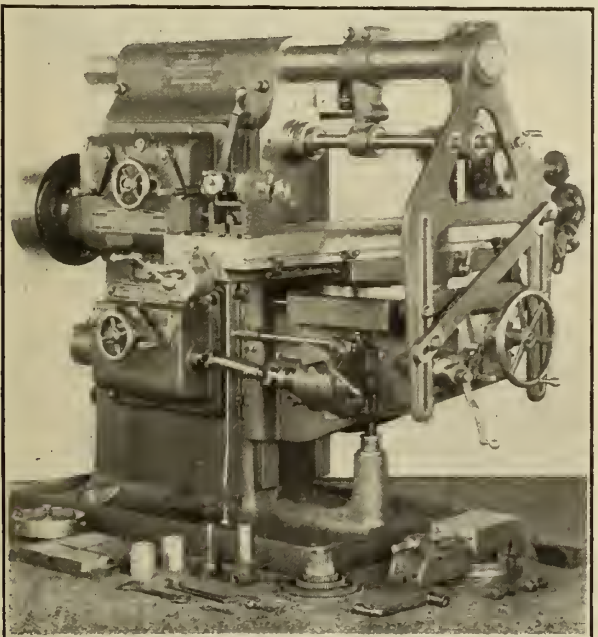


Fig. 1—Horizontal Miller; Parallel Driv e.

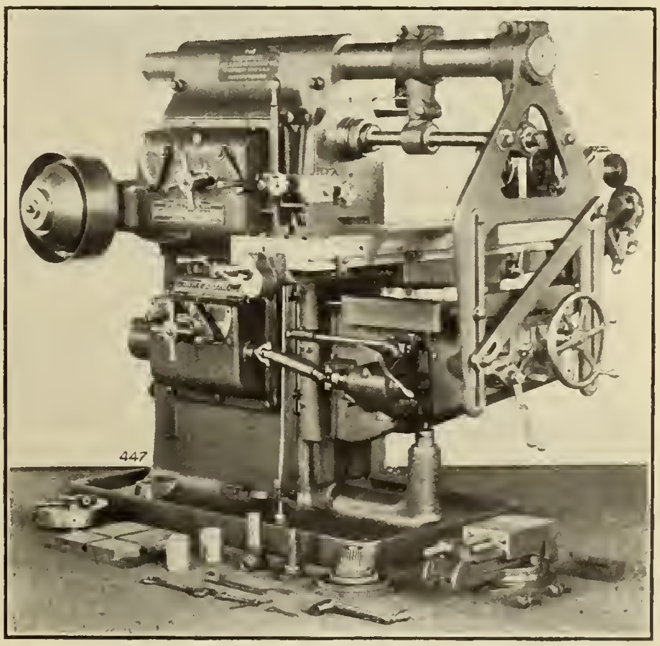


Fig. 2—Horizontal Miller; Right Angle Drive.

standard spiral milling cutter with nicked teeth and assuming material to have 55,000 lbs. tensile strength, is ½-inch deep and 5 or 6 inches wide at such a rate per minute to remove from 7 to 8 cubic inches of metal.

Unit Construction.

Each machine consists of a system of units which are interchangable on all machines horizontal and vertical of each size. All mechanisms which had to do with feed or speed changing, or the operation of the machine in any way is on the front or operator's side and within convenient reach, and so arranged as to permit of changing either the feeds or speeds with the greatest ease and in the however, gives the feeds in thousandths per revolution. By the changing of a bracket as before, this cone-pulley machine becomes one with the driving shaft parallel with, or at right angles to, the spindle, as desired. By changing the driving pulley for a sproket wheel and adding a bracket at the base, the constant speed belt machine becomes a constant speed motor-driven machine and by a similar interchange the cone-pulley becomes a variable speed motor-driven machine, the feed being appropriate drive in each case.

The same system is applicable to vertical spindle machines. By merely changing the frame and drive twelve distinct machines are derived. Illustrations 1 arrangement and Fig. 8 shows the position of the operator when changing speeds.

Constant Speed Miller.

Figs. 9 to 12 shows the constant speed mechanism. Fig. 9 the inside of speed change or main drive box. The outside with operating levers, pilot wheel and index plate are illustrated in Fig. 10. The entire transmission train is shown in Fig. 11. The main driving pulley is mounted on bracket "a" attached to the machine frame. It transmits power to the main driving shaft "b" through the friction clutch shown which is operated by the lever shown in the illustrations. When this clutch is

disengaged, the pulley runs free on the bracket and is the only part of the machine that turns over. This construction has two advantages. It makes it practical to drive the machine from the main line shaft without the use of an intervening countershaft and the strain due to the pull of the main driving belt does not come on the shaft, thus relieving it entirely of bending strains.

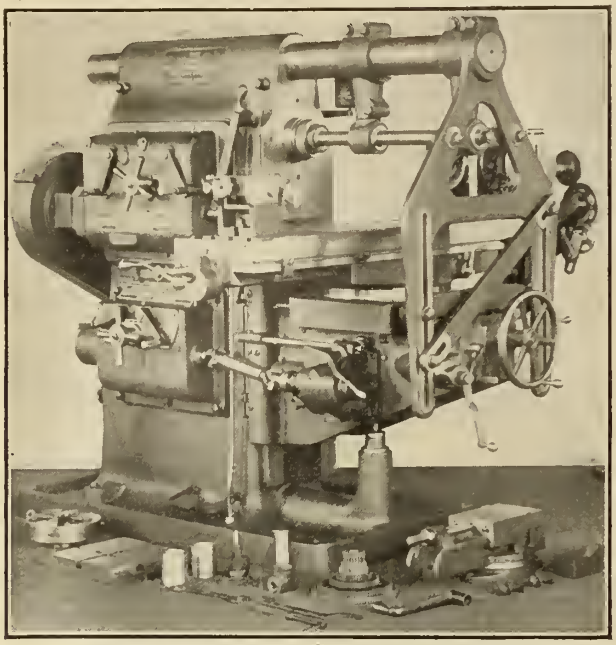


Fig. 3—Constant Speed Motor Drive.

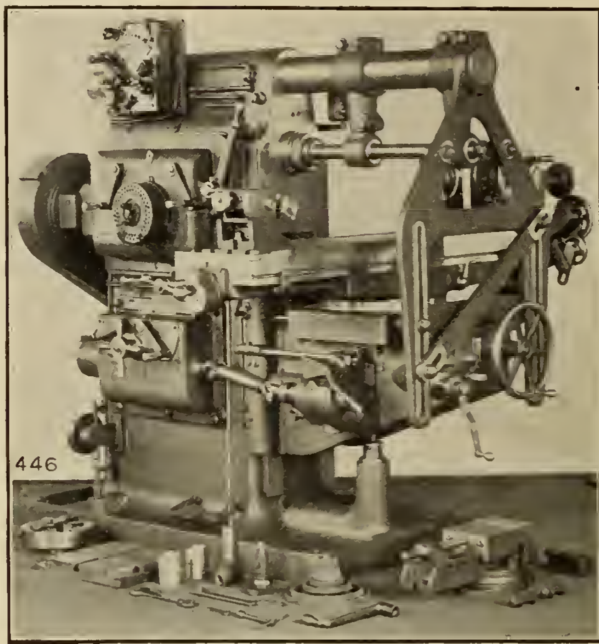


Fig. 4—Variable Speed Motor Drive.

Suppose the pulley clutched to the shaft: Power is transmitted to the tumbler gears CC, which may be brought into mesh with any one of the cone gears thence through the sliding gear "e," the long quil "g" and the back gears hijk which provides four different speeds. If the sliding gear "f" is brought into mesh with cone gear, a different series of four speeds is provided. Again, if the back gears are slid out of engagement and the clutch teeth "l" are engaged transmission is direct through any one of the four cone gears and the sliding gears, thus giving two additional series of four speeds each, making a total of sixteen different spindle speeds, the eight fastest of which are obtained with only two pairs of gears in mesh, the eight slowest requiring four pairs of gears in mesh.

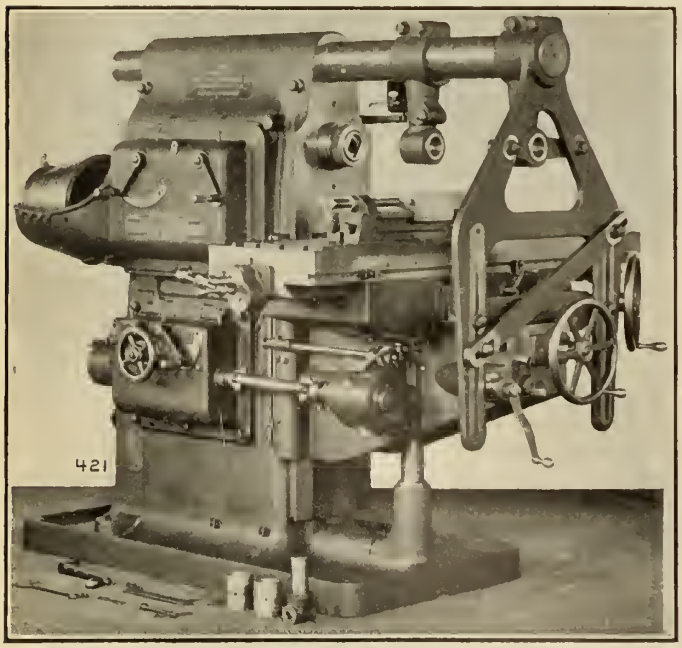


Fig. 5—Plain Drive.

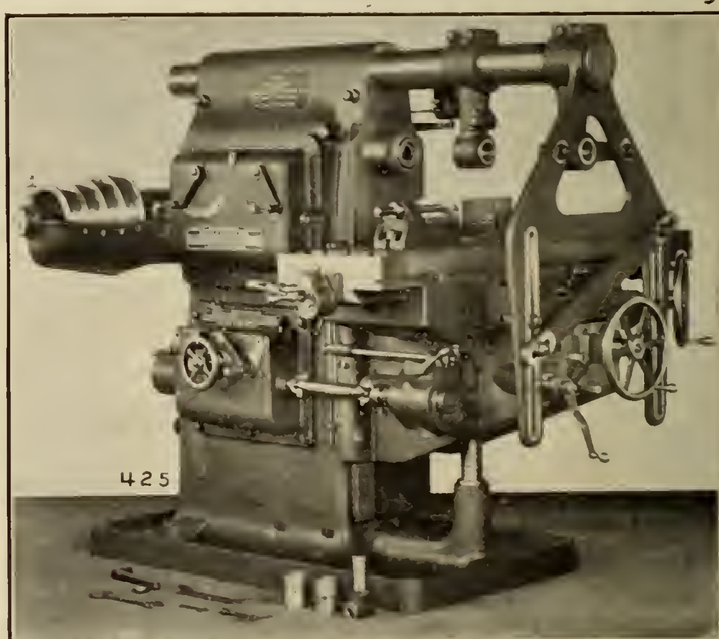


Fig. 6—Right Angle Drive.

There are a number of novel features in this construction. It will be noted that the sleeve "g" has keyed to it the small gear "m" and the sliding gears "e" and "f" are fastened together and ride on the outside of the sleeve "g" and always revolve with it. The entire combination of sliding gears and sleeve "g" run free on the spindle. The large gear "k" is keyed to the spindle and is always the point of application of power to the spindle, the transmission being through the above mentioned sleeve of large diameter, thus relieving the spindle at all times of torsional strains throughout its length.

The sliding gears are operated by the

lever shown in Fig. 10, which takes the positions C and D. The back gears and the clutch pinion are simultaneously moved by the lever which takes the posi-

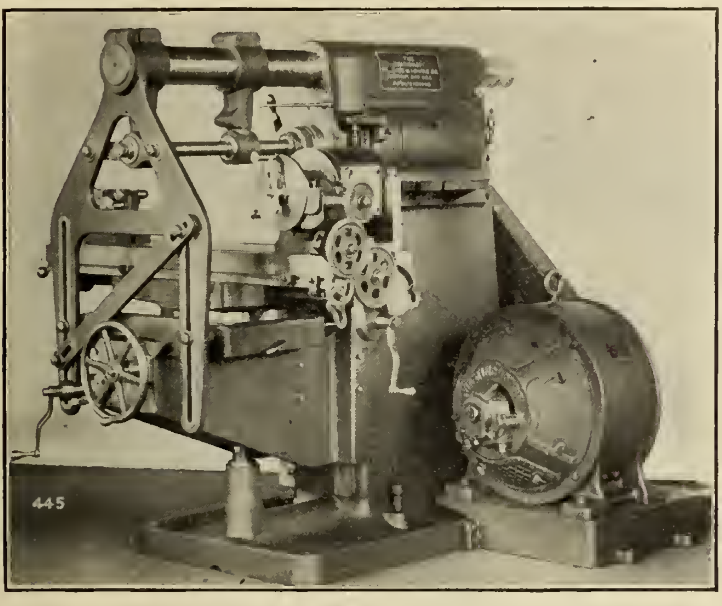


Fig. 7—Motor Drive Arrangement.

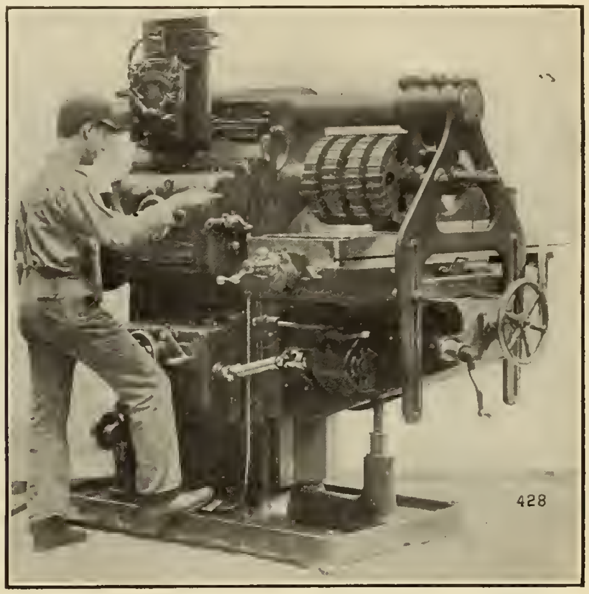


Fig. 8—Position of Operator.

tion A and B. The heavy parts which have to be moved are shifted with very little effort on the part of the operator.

The small toothed pinion "m" is not used for transmission but simply acts as a pilot for convenience in bringing the gears into engagement. It is formed a part of pinion "h," having the same number of teeth. Assuming that the clutch teeth "l" are in engagement and the operator wishes to change to slower speeds through the back gears, the lever is moved to the A position. The first part of its motion will cause a disengagement of the clutch teeth "l." Meanwhile pinion "j" is not yet in engagement with "k" and therefore does not

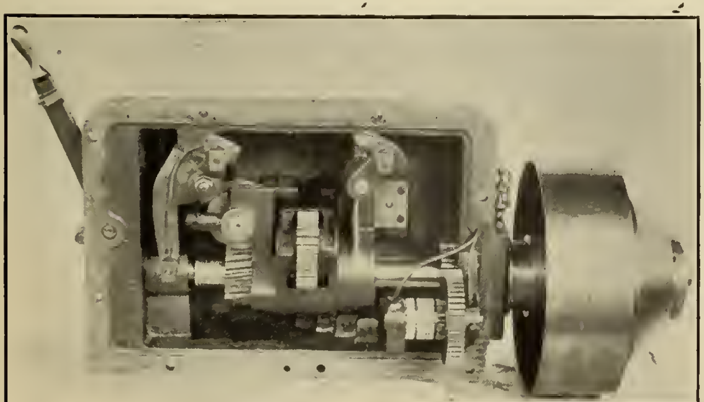


Fig. 9—Inside Speed Change Box.

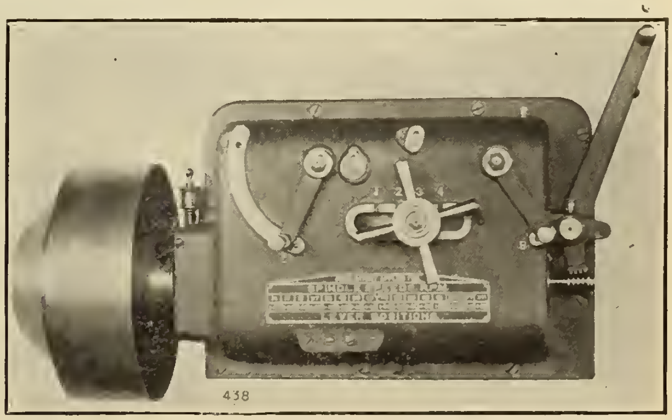


Fig. 10—Outside Speed Change Box.

revolve. The clutch being out of engagement, the face gear is also idle, and it might therefore happen that the teeth of "j" would not come opposite the spaces in the gears "k," in which case it will be impossible to bring these two gears into engagement, but "m" prevents such a possibility. It enters two gears into engagement with "i" before the clutch is entirely disengaged, and thus revolves "i" and "j" before the latter comes into engagement with "k."

The intermediate or back gear shaft is fixed stationary. The cone gears and the back gears run free on this shaft. It is, therefore, never subjected to torsional strains, but only bending strains due to the thrust of the gear teeth. From the above it will be seen, that neither the driving shaft "b," the back gear shaft, nor the spindle throughout its length are at any time subjected to both bending and torsional strains, thus greatly increasing the rigidity of these parts as transmission members.

The tumbler gears CC are mounted in a large frame, which is carried on a slide in the drive box. Its construction and operation will be clear from drawing, Fig. 12. The tumbler is operated by means of the pilot wheel on the outside of the box, Fig. 10. Its four positions being indicated by the numerals 1, 2, 3, 4. The gears CC are carried in a rocking yoke, which is trunnioned in the main tumbler frame. On one of its trunnions it carries the segment of a spiral gear, and this engaged with a spiral gear carried on the end of the pilot wheel shaft. If the pilot wheel is turned to the left, the swinging yoke carrying the tumbler gears, is revolved by the above mentioned spiral gears and is thus raised clear of the cone gears. The entire tumbler mechanism may then be moved laterally to the desired position and is properly located by a detent pin. Then, by turning the pilot wheel to the right, the tumbler gears are brought into mesh with the proper cone gear, and the depth of their meshing is determined by a stop pin, against which a lug of the rocking yoke abuts. If, after these parts have been brought home additional pressure is put on the pilot wheel, it serves to act through the spiral

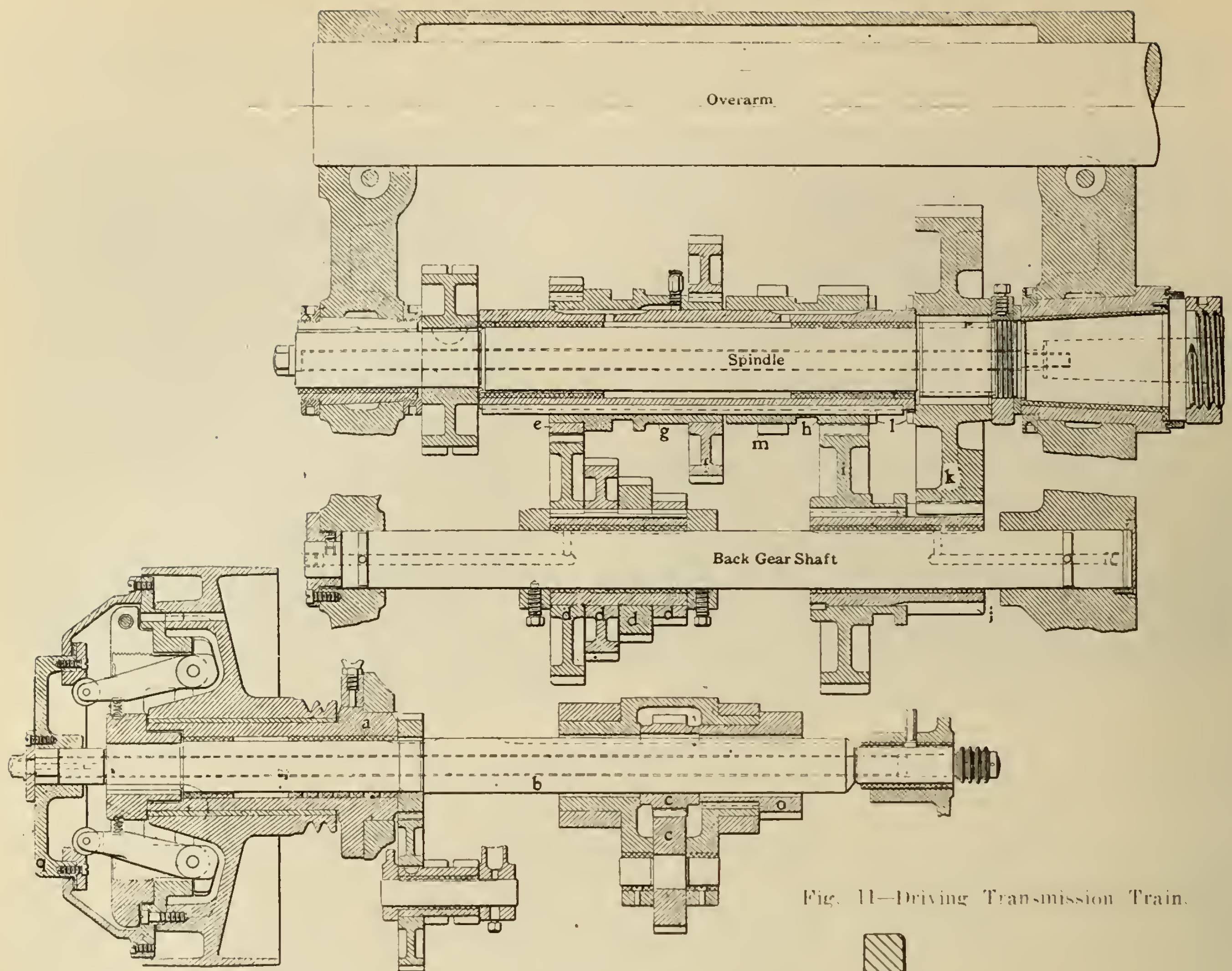


Fig. 11—Driving Transmission Train.

gears, and the swinging yoke, forming a combination of screw and levers, which lock the main tumbler frame to its slide. The tooth angle of the spiral gears is small, making them self-locking.

From the above it will be clear that the entire weight of the tumbler and its parts is supported by its slide. The main driving shaft has clearance through the tumbler and is, therefore, not subjected to the weight of these parts, nor does it get any of the strains resulting from the locking feature. This is radically different from the usual construction on machine tools. The spindle speeds are indexed on a plate located immediately below the speed-change levers, Fig. 10.

Starting Treadle.

Should the gears interfere when shifting the levers, they may be revolved slightly by exerting a gentle pressure on the treadle shown in the illustrations of the complete machines.

The treadle is attached to the main starting lever. Pressure on the treadle moves the main clutch still farther out of its engaged position, and brings into contact the surfaces of the disk "q," which is attached to the driving shaft, and the surfaces of the flange "r," Fig 11, which is attached to the driving pulley. When changing the speeds by gently pressing on the treadle they will revolve suffciently to allow the lever to be set in the desired position very quickly.

The Spindle Lock.

When attaching or removing arbors, or more especially, face mills which screw on the nose of the spindle it is always desirable to lock the spindle. If this is done by the usual method of lock-

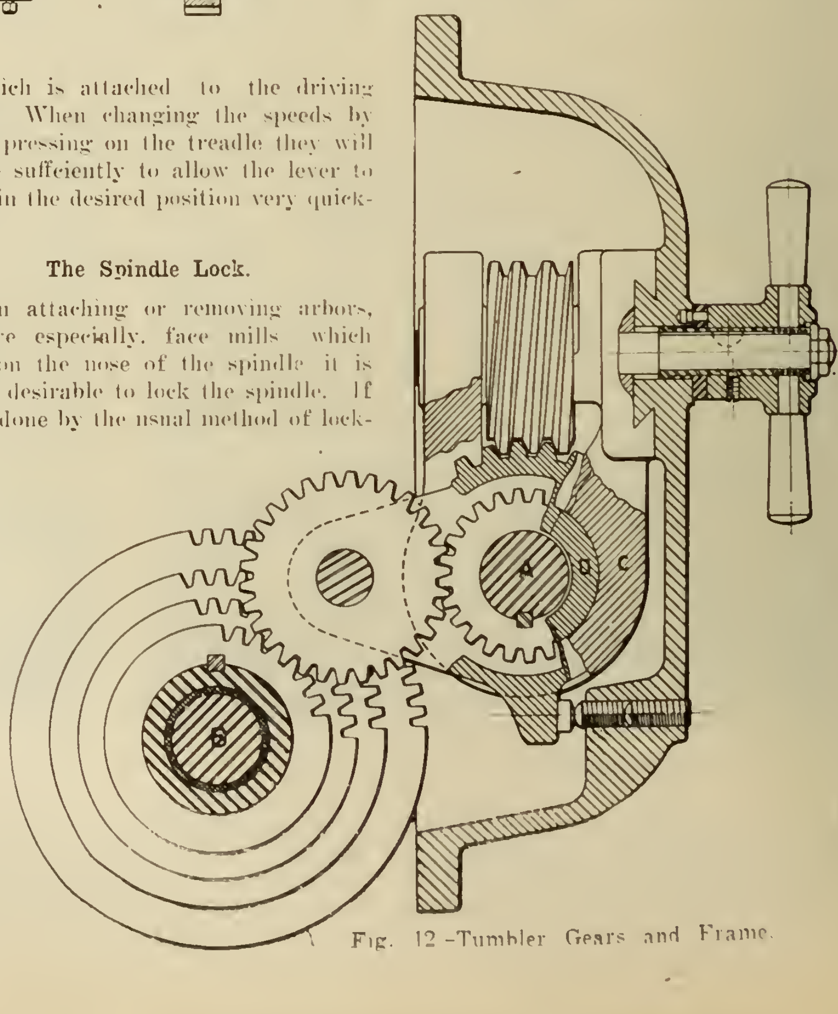


Fig. 12 -Tumbler Gears and Frame.

ing the gear train, the shocks resulting from unscrewing a large mill, come directly on the gear teeth. All of these machines are provided with a locking pin which engages ribs on the face gear web, and these members instead of the gears themselves, constitute the lock. The locking pin is controlled by the plunger seen immediately under the starting lever, Photo 418. When this pin is pulled out, the spindle is locked. When the machine is started, the first movement of the starting lever pushes the plunger in, releasing the lock before the driving clutch can come into engagement, and at the final position of the lever the plunger remains beneath it and the lock is held open. Thus, it will be seen that this lock is automatically released, making accidents impossible.

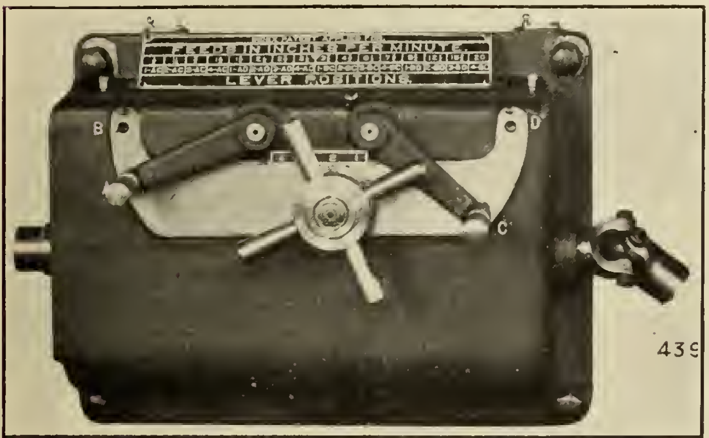


Fig. 13—Outside Feed Box.

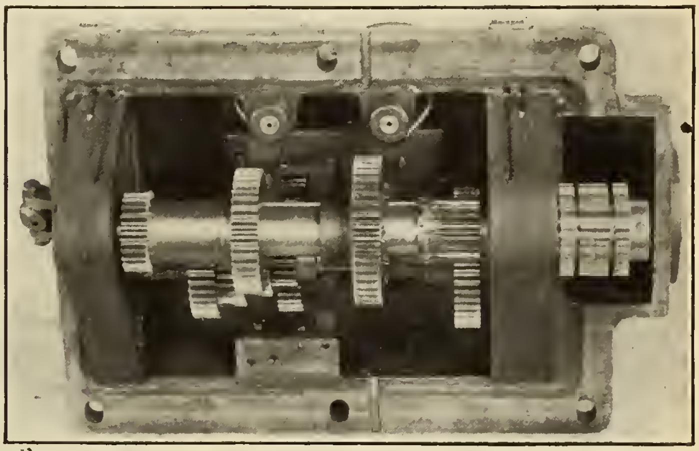


Fig. 14—Interior Feed Box.

The Feed Mechanism.

The outside and inside of the feed gear box are shown in Figs. 13 and 14, the location of this box being below that of the driving gear box shown in the general illustrations. The feed mechanism provides a series of 16 feeds The construction of the feed box and the main spindle drive are essentially the same and these are operated in the same manner except that the feed may be changed throughout the entire range while running. The clamping of the tumbler gear in position after adjusting is the same in both. The principal difference in the arrangement of the two gear boxes is that the driving-gear arrangement is reversed in the feed box; that is to say, the tumbler shaft, instead of being the first, is the last shaft —an arrangement which makes it possible to provide gears of large diameters running at moderate circumferential speeds, the result being to make it easy and safe to shift the gears while running.

Reversing Box and Feed Trip.

The feed power is transmitted from the feed box through the universal joint shaft to the feed tripping and reversing box at the side of the knee. This is assembled as a unit and is shown in detail in Figs. 15 and 16. Referring to Fig. 15 the ends of the two parallel shafts which run through the box are seen. Gears on the universal joint shaft drive the gears shown at the left of Fig. 16, the gear at the right being driven direct, and the one at the left through an idler pinion. A clutch engages the gears at will with the shaft on which they run and thus determines the direction of rotation of the shaft, of the pinion at the extreme right and hence the feeds. The location of the reversing clutch at the beginning of the feed mechanism makes it serve for both of the horizontal and the vertical feeds. The shaft upon which the tripping clutch is mounted, runs ten times as fast as the feed screw, and therefore the pressure on the clutch teeth is only one-tenth of the pressure to which tripping clutches mounted on the feed screw (which is the usual location) are subjected.

The arrangement and properties of the feed-tripping mechanism will be understood by reference to Fig. 17, which shows the knee and table in two views, partly in elevation and partly in section. The connection with the universal-joint shaft will be seen at "a," while at "b" and "c" are the two gears al-

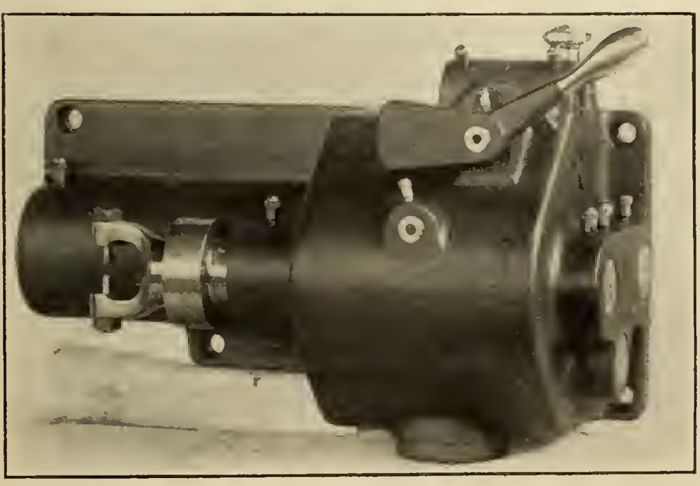


Fig. 15—Inside Feed-Tripping and Reversing Box.

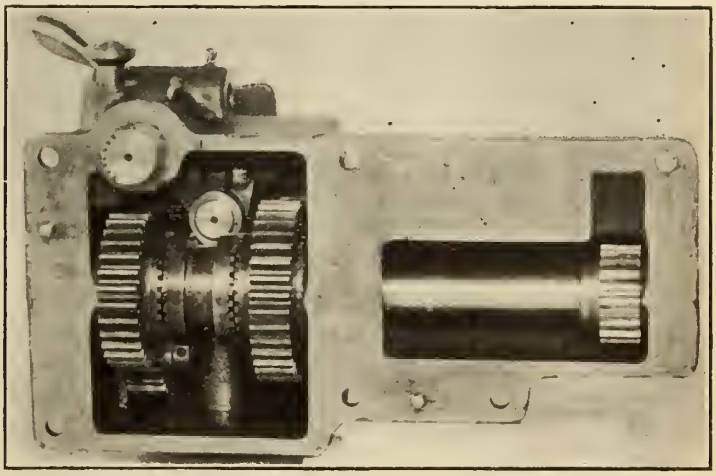


Fig. 16—Inside Feed-Tripping and Reversing Box.

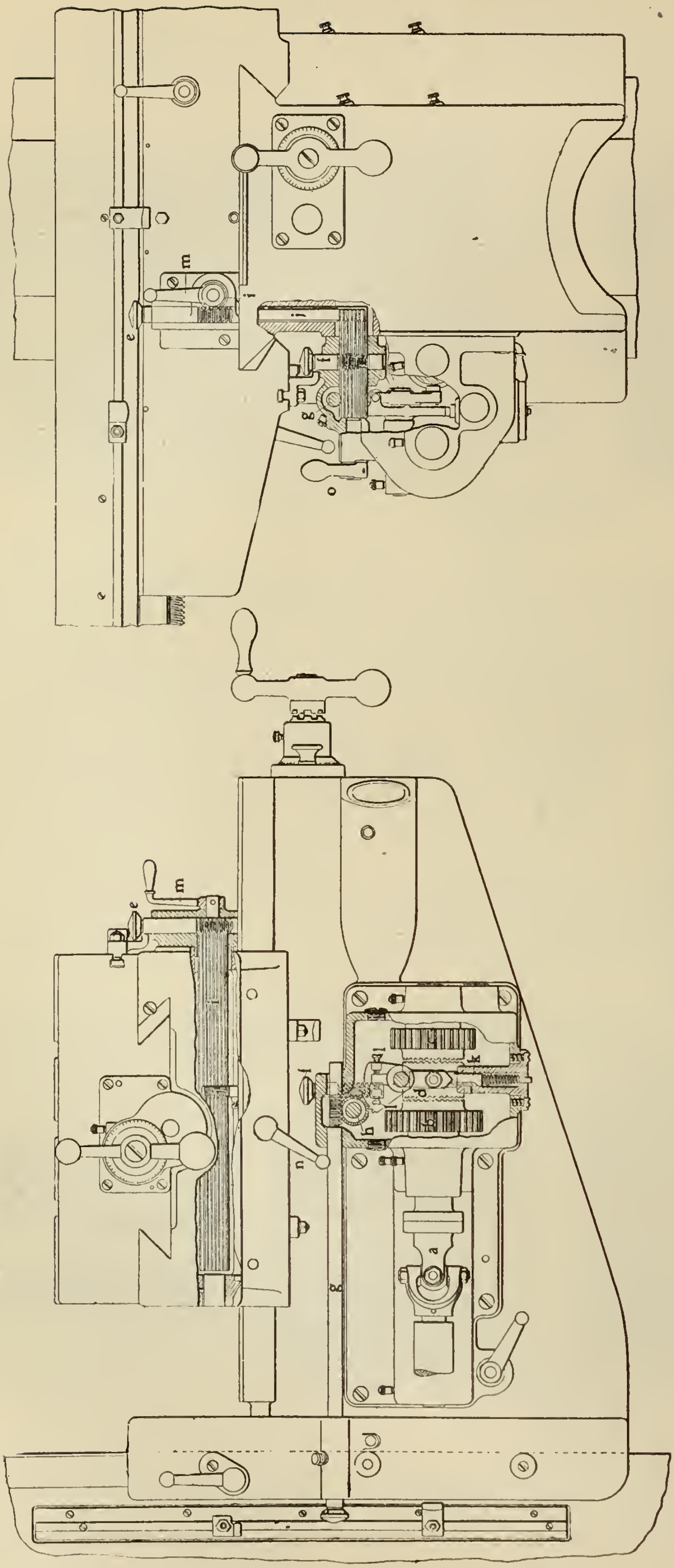


Fig. 17—Feed-Tripping Mechanism.

ready shown at the left of Fig. 16 with the reversing clutch "d" between them. At "e," "f" and "g" respectively are the tripping plungers for the table lengthwise, crosswise and vertical feeds. Each one, it will be noted, has a circular rack at one end, all, either directly or indirectly, engaging the pinion "h," which operates the tripping clutch "d." In the case of the plunger "e" the connection with pinion "h" is through long pinion "i" which extends through the saddle and thus operates the secondary plunger "j." The elongation of the pinion "i" is obviously to provide for the in and out movement of the saddle along the knee.

The neutral positions of the tripping plungers, which give the neutral position to the clutch "d" are in all cases the middle; one extreme position of a plunger engaging the clutch in one direction and providing a feed in one direction, while the other extreme position gives the feed in the opposite direction. The heads of the plungers are double opposing cones, and each of the power feed movements is provided with two trip dogs; one of a length to operate on one cone surface while the other operates on the other; one dog serving to trip the feed for a movement in one direction, while the other operates in the opposite direction.

By removing the notched plunger "k," which holds the clutch in the middle or neutral position, and substituting therefor a knife-edge plunger, and then slacking up the adjustable screws "ll" on the trip segment, the tripping mechanism becomes a reversing mechanism, the table feeding back and forth precisely like the table of a grinding machine, for example. This feature allows the table to be fed in either direction. By having two fixtures on the table the operator may chuck a fresh piece in one fixture while the machine is at work on the other, the table tripping and reversing as soon as a piece is finished without the loss of time due to removing and chucking pieces and running the table back by hand.

The feed-engaging levers act directly on the tripping plungers, lever "m" serving for the longtitudinal, "n" for the crosswise and "o" for the vertical feeds, and in each case the direction for movement of the lever is the same as that of the resulting feed.

Vertical Millers.

The mechanisms described above apply to both vertical and horizontal millers.

The most strikingly different feature of these machines as compared with the usual vertical miller is the exceedingly massive and rigid vertical spindle head. It is the belief of the Cincinnati Milling

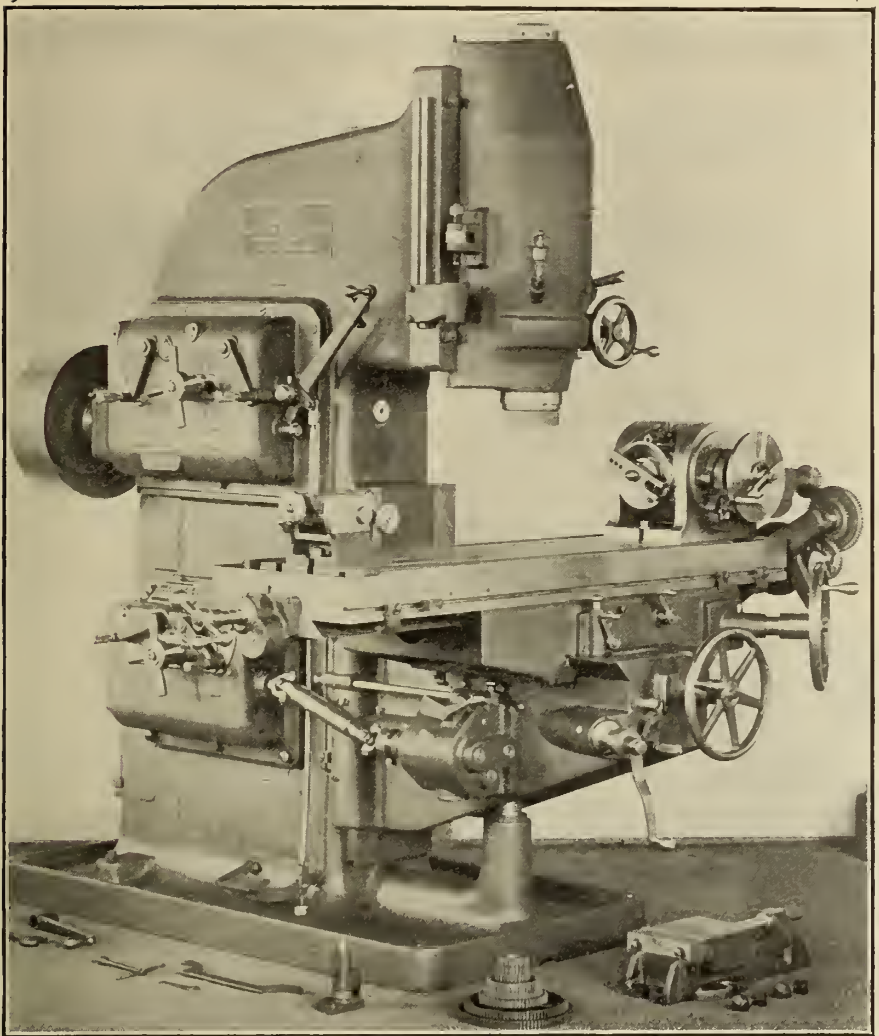


Fig. 18—Vertical Machine Arranged for Cutting Spirals.

Machine Co. that there is a vast amount of work being done in machine shops on other tools, which could be done very much quicker and better on a vertical spindle miller, that is designed in the right proportions to give it the necessary strength to do heavy, fast-cutting and at the same time arranged as conveniently as a horizontal machine.

The design of our new vertical millers was founded on this belief, and the design was carried out with the view of producing a machine that would be thoroughly adapted for the lighter profiling work which the usual vertical millers are intended for, and at the same time have the necessary strength to do heavy rapid milling.

Fig. 18 illustrates a vertical miller equipped with dividing head for cutting spirals. Fig. 19 shows the detail of drive of vertical machines, the spindle and spindle driving gears. A circular milling attachment, shown in detail in Fig. 20, is provided. Referring to Fig. 20 "a" is the feed operating and reversing lever, "b" is the hand-feed attachment, and "c" is a lever which disengages the power feed, for which purpose the driving worm is mounted in an eccentric sleeve controlled by this lever. The object of this arrangement is to permit quickly swinging the table into

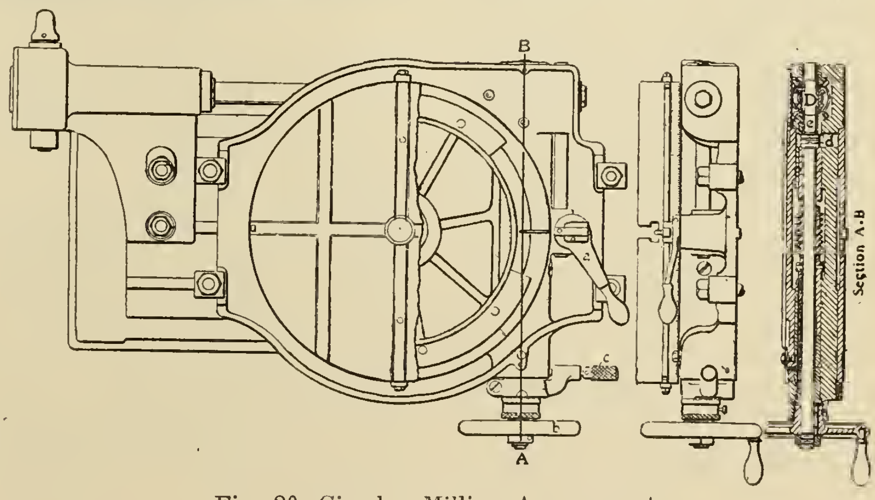


Fig. 20—Circular Milling Arrangement.

position for beginning the cut in those cases in which the milling comprises a portion of a circle only. The movement of the worm shaft for this disengagement is accomplished very neatly by the use of an Oldham coupling at "d," which permits the worm shaft to be shifted parallel with itself without interfering with the driving connection with the short bevel-gear and clutch shaft "e."

These machines are designed and built

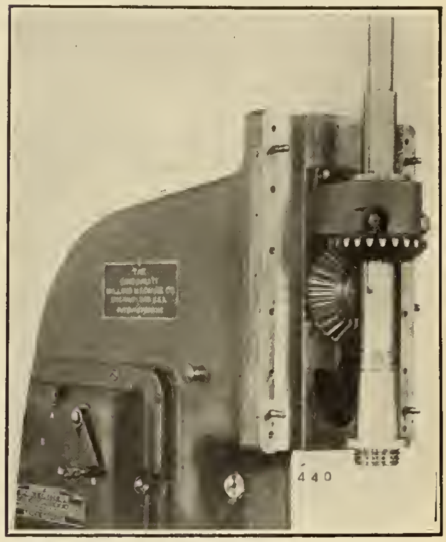


Fig. 19—Detail of Vertical Machine Drive.

by the Cincinnati Milling Machine Co., Cincinnati, U.S.A.

"Willie, did you pinch Nellie?" asked the teacher.

"Aw, gwan," replied Willie, "she ain't pretty enough to pinch."

When approaching from behind, don't get excited over a sylph-like form. Maybe her face is enough to stop a clock.

Manfred Freeman, manager of the Lethbridge Electric Co., was presented with an address and locket and chain by the employes when the municipality took over the plant.

The Canadian Manufacturers' Association Convention

The Thirty-seventh Annual Meeting in the Windsor Hotel, Montreal, was well Attended and Great Interest was Manifested in the Topics Under Consideration.

The annual couference of the Canadian Manufacturers' Assiciation was opened on Tuesday, Sept. 15, and was well attended.

The following officers were elected for the ensuing year:

President—R. Hobson, Hamilton, Ontario, president of the Hamilton Steel & Iron Co.

Vice-President—J. Hendry, Vancouver, B. C., British Columbia Mills, Timber and Trading Co.

Provincial Vice-Presidents — Ontario, W. M. Gartshore, Hull; Quebec, W. H. Rowley, Hull; Nova Scotia, W. Levis. Halifax; New Brunswick, C. McDonald, St. John; Manitoba, R. McKenzie, Winnipeg; Alberta and Saskatchewan, P. Burns, Calgary; British Columbia, J. G. Woods, Vancouver; Prince Edward Island, F. L. Hussard, Charlottetown.

The President's Address.

Hon. J. D. Rolland, of Rolland Paper Co., Montreal, in the annual address, made a strong plea for higher protection of the woolen industry. He referred to the depression and pointed out that although we did not feel it to as great an extent here as in other countries, it had taught the manufacturers a lesson. The manufacturer has been impressed as never before with the fact that his very existence depends upon the thorough organization of all his departments. It had led to the discovery of leakages that might have gone on undetected for years. The depression during the past year had compelled them to investigate closely the cost of production and a betterment of processes was probably the result. Mr. Rolland advocated that a vigorous policy be undertaken to preserve the forest and stop the exportation of pulpwood. He recommended the co-operation of the association and the Provincial Governments in the matter of technical education.

Reception by Montreal Branch in the Evening.

The reception tendered the visiting manufacturers and their wives by the Montreal branch at the Redpath Museum McGill University was brilliant and pleasant. Alderman Sadler wished the guests welcome and Principal Peterson; McGill University, made a brief address, to which R. Hobson replied. During the evening a delightful musical programme was rendered and solos were given by Mrs. Clementine Varney-Huber and Mr. Joseph Saucier.

WEDNESDAY, SEPT. 16th.

The committee on railways and transportation reported, and a tribute was paid to the work done by the Railway Commission and the Georgian Bay canal scheme was upheid.

Uniform Boiler Law.

F. E. Leonard, London, Ont., in presenting the report of the engine and boiler section, pointed out that boiler manufacturers were handicapped by local boiler inspectors and construction acts, which were playing havoc with the trade.

R. HOBSON, PRESIDENT C.M.A.

What boiler manufacturers wanted was uniformity in the inspection laws, similar to that which had been inaugurated and carried out in the steamboat act in the Dominion.

D. W. Robb, Amherst, and Mr. Waterous also spoke on the question, pointing out the necessity of a uniform lay. The matter was then referred to the parliamentary committee. A set of boiler inspection regulations has been drawn up to cover land and stationary boilers, and steps will be at once taken to procure uniform inspection. The report of the tariff committee was then taken up and the morning session was spent in discussing it.

THURSDAY, SEPT. 17th.

Among the subjects for discussiou at the morning session was technical education. The Canadian Manufacturers' Association is negotiating with the Federal Government with a view to get them interested in the matter. An appropriation of $5,000 was voted towards the expenses of a commission to report on the whole question. A sub-committee will enter into immediate negotiations with the provinces to gather complete data on this subject.

It was pointed out that technical education as applied to agriculture, had made the Canadian farmer the envy of the world; the lack of technical education was greatly detrimental to the success of some of our other industries.

ANNUAL BANQUET.

Progress and prosperity were clearly indicated in the enthusiastic gathering of over 350 captaius of industry who assembled in the Windsor diniug hall to listen to the speeches of the foremost statesmen in the Canadian public life. Mr. Hobson, in proposing the toast of Canada, referred to the national character of the association. He pointed out that the C.M.A. stood for the promotion of the commou good of the nation as a whole, believing that whatever works for the betterment of Canadian industry, be it of the farm, the forest or of the factory, works for the betterment of our great Dominion.

The Premier Warmly Welcomed.

A tumultuous applause greeted Sir Wilfrid Laurier as he rose to answer the national toast. He touched on many topics, the woolen industry and tariff, taking up a great deal of his time, and expressed himself in favor of a permanent tariff commission, such as exists in the United States.

Sir Lomer Gouin, speaking on this topic, said in part: "In these days of competition, the best equipped nation is the one most likely to win out. It is for this purpose that your association exists, and it is also for this purpose that the Government of Quebec has decided to create and maintain modern technical industrial schools. We are now spending a million dollars in the creation of such schools in the Province of Quebec and in Montreal, and I may say in your presence, that if one million is not enough, we are prepared, and are in a position, to spend another half million—and, if it is necessary, to spend two millious or even three millions, to have in the Province of Quebec a perfect system of technical education."

MACHINE SHOP METHODS AND DEVICES

Unique Ways of Doing Things in the Machine Shop. Readers' Opinions Concerning Shop Practice. Data for Machinists. Contributions paid for.

POINTS ABOUT SHAFTING.

By R. Manly Orr.

Next to the care and proper operation of the actual power plant, comes the care of the shafting which is to convey the power to the various points in the factory building where it is to be used. Recognizing this to be a fact, a great many superintendents have placed the care of their shafting and belting under the charge of their engineer, and I have come to regard the union of the power-developing and power-transmitting systems as an entirely fitting and proper combination. A friend of mine once said that when going on a very long bicycle ride, he paid just as much attention to the easy running of his wheel, as to the strength and fitness of his muscles. Just so, it may be that while the valves are all properly set in the engine room, the condition of the shafting out in the factory may be such that the power department economy will be considerably lessened.

Reference to the accompanying illustration Fig. 1 will explain a bit of shafting trouble which belongs to my present plant and comes as the result of faulty hanging.

A—Floor between 1st and 2nd storeys of the building.

B—Beams running lengthwise of building.

C—Larger beams running crosswise of building.

D—Posts supporting beams C.

E—Short crosswise timber for hanging hanger from.

G—Post hangers.

Now it happens that in one of the departments on the upper floor, at the point H, tons of material are alternately piled up on the floor and then removed. For some time the shafting K kept pulling out of the coupling J, and no amount of keying would keep it in for any reasonable length of time. After some watching I found that the beam B sagged down under the heavy weight above, and then sprung up again on its removal. This of course forced the shaft down during part of the time to the position indicated by the dotted lines. The effect produced on the coupling at J can easily be understood as being the same as that produced on a post in the ground when one walks about it pulling its top in different directions alternately.

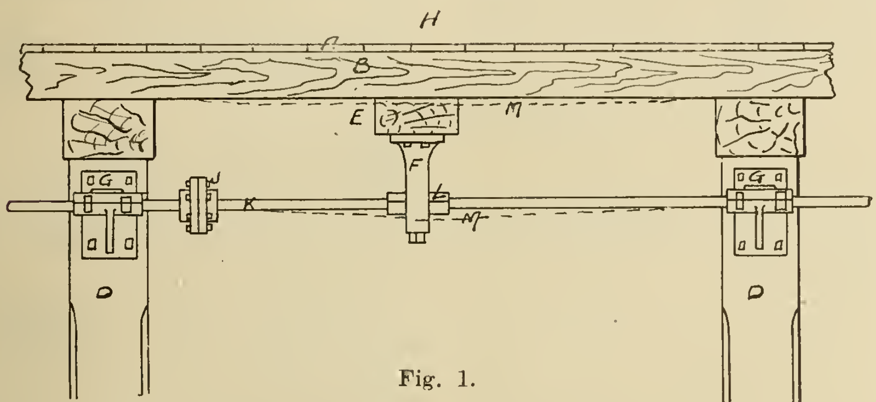


Fig. 1.

The trouble was overcome by removing the cap off the hanger box L, it being impossible to place a post under E, and there also being no belts running on that particular length of shafting.

In installing shafting I would make it a rule to arrange for placing all hangers for shafting either at, or very near those beams supported by posts. Where heavy belts draw horizontally on the shaft, I would also advise the use of hangers in which the division of the journal was arranged at an angle of 45 degrees, and as the timbers shrank, I would closely follow up all nuts on hanger support bolts, lest the draw on the belts should pull the hanger sideways on its slotted holes and thus pull the shafting out of line. Then again, I would carefully avoid excessively tight belts. This I would do in three ways : First, by referring to Fig. 2, I would arrange my shafting so that as far as possible the slack side of all belts would be on top, which gives the belts a greater contact with the pulleys. If the shaft were to revolve as at A, then I would install the shaft in the position A, but if the shaft were to revolve as at B, then I would install the shaft in the position B. Second, I would use a liquid dressing on my belts so that they would be kept in a pliable condition. For this purpose, I would recommend the use of pure neatsfoot oil applied sparingly and often—one can soon see how much is needful. I know of two patented liquid dressings which have given me satisfaction. Third, I would use larger pulleys and high belt speeds. I would even go to the trouble of raising the sizes of pulleys where a belt was running excessively tight, and I believe I would be repaid in the end.

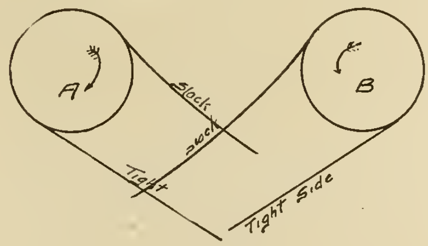


Fig. 2.

Now, in closing, let me say that I am not a lover of very slack belts, nor do I take any objection to a fairly tight belt. It is an excessively tight belt that I do not like. Let me here explain a little point that is not understood by some men I have talked with. Referring to Fig. 3 some roughly imagine that the horizontal strain on each of the two shafts when the load is on—the tension on both sides of the belt when the load is off—the extra tension on the tight side when the load is on. Now this is

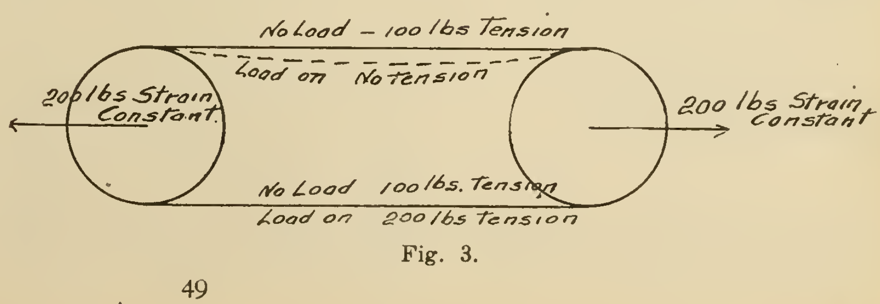


Fig. 3.

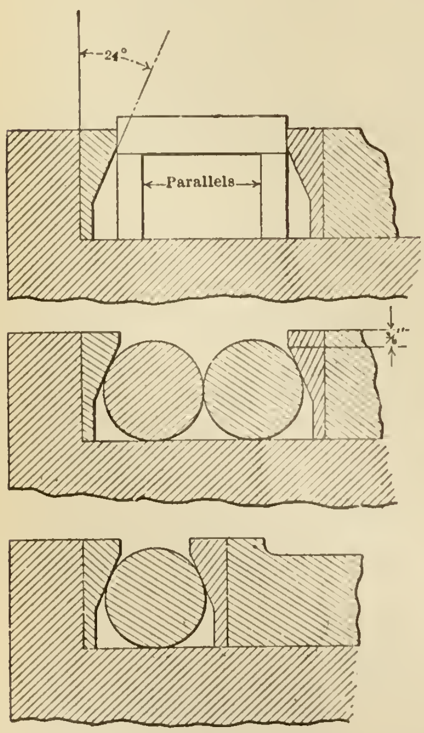
a mistake, because the on-coming load only reduces the tension on the slack side and transfers it to the tight side without at all increasing the total strain on the shaft. No matter how tight any belt may be, and no matter what strain its tension may put on the shaft, if one side of it slacks down at all when under load, then there is only the strain due to the load, effective on the shaft bearing, and the original tension of the belt is lost. It can easily be seen by this that every belt can be kept so tight that it will just show slack under strain of load, and the shaft will not thereby be subjected to any strain above that due to the tension of the tight side in pulling the load.

Where belts were used in a way that left them running idle a very great part of the time, I would always use a fast and loose pulley of different sizes, with a bevel shoulder on the loose pulley rising to the size of the tight one. I would also use ring oiling bearings on shafting in preference to any other device.

JAWS FOR MACHINE VISE.

(By W. P. Hunt.)

The machine vise jaws shown in the sketches herewith, which we have found very useful in our shop, were first devised by our foreman for use in key-seating a lot of shafting, so that we could hold two shafts at once without going to the expense of making special



JAWS FOR MACHINE VISE

holding devices for them. We believe that these jaws are far better for a general purpose vise than the ordinary jaw in use, planed square from the top to the bottom, as they hold any kind of round work far better than common jaws, always drawing it firmly to the bottom and insuring that the key-seat will be cut parallel with the shaft. For planing thin, flat work, it is, with them, easier to draw a job down on to parallels than with the common jaws; in fact, we have found no job where they do not give better results than the plain jaws.—American Machinist.

A TALK WITH OUR READERS.

Each month we have given you some good ideas for jigs and methods which lessen labor and save time. We want more of these articles.

Do you know of any short methods of doing work in your machine shop? Have you arranged data in a form which you find valuable?

We are looking for that class of material. Write about it in your own words. Make a sketch if possible. It may be rough but we will attend to that. If your article is acceptable we will arrange it for publication and pay you liberally for it.

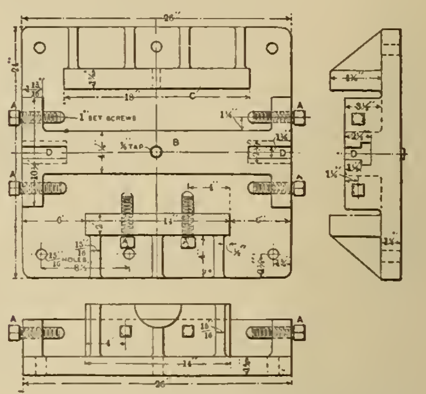
The only stipulation is that the article give a useful idea. It may be an old device that you did not think worth while writing about, but it may be just the thing another mechanic is looking for. Address Canadian Machinery, 10 Front St. east, Toronto, and it will reach the editor.

BORING DRIVING BOX BRASSES.

By A. B. C., Port Huron.

The following are jigs used for holding driving boxes while their brasses are being bored. The jig for a vertical boring mill consists chiefly of two castings in the form of angle plates. The distance between these angle plates or jaws is made to suit the largest box in use, and the jaw to the left is made adjustable so that the jig can be used for smaller boxes. When the jaw is to be adjusted the four cap screws which hold it are removed, the angle plate moved in, and the cap screws inserted into another set of holes which are drilled and tapped in the proper place. The jig is provided with two tie bars, one across each end. These tie bars are for the purpose of taking the end thrust when heavy cuts are being taken, and they also facilitate the adjustment of the box. The forged lugs, which hold the tie bars, are held in place by nuts, which are on the inside of the jaws. A shoe is fastened to the right jaw, and the shoe faces of all driving boxes are clamped against this shoe. When a set of boxes is to be bored, one is first laid out central with the shoe and wedge faces, then this box is clamped in the jig and the jig is set by it. All the boxes are then bored without shifting the jig. The roughing and finishing tools are both clamped in one tool holder, and the roughing and finishing cuts are taken simultaneously.

Fig. 18 shows a jig used for holding the driving boxes when the brasses are being bored in a horizontal boring mill. The set-screws A provide means for adjustment, and also help to hold the box in place. The shoe face of the box is



Boring Driving Box Brasses.

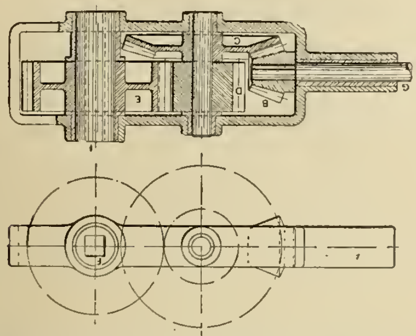
clamped firmly to the face B on the jig by bolts which fit into the tee slots D, and by a clamp which passes across the wedge face of the box. These bolts and the clamp are shown in Fig. 2. When a narrow box is to be bored, it is set central with the face B on the jig by bolting a parallel piece along the face C. This jig is set by practically the same method described for the vertical mill. One box is first laid out central and clamped in the jig, the jig is then set on the table, and the table set to the proper height and clamped. All the boxes are then bored without altering the position of the table. In this way, the distance from the bore to the shoe face of each box is exactly the same. Many prefer to set up each box separately, but I have found the method described to give the best results. This boring bar also contains two tools, each tool having an adjustment which saves much time in setting the tools.—Machinery.

RIGHT-ANGLE POWER HEAD FOR DRILLING AND REAMING HOLES.

By T. B. Burnite.

The accompanying cut, Fig. 19, illustrates a right-angle power head which is used principally for drilling and reaming holes in locations where it is impossible to use the regular tools. Especially is the tool found very valuable where traction engines, locomotives, or cars are being repaired. It is often found that the pneumatic drill, or the electric drill, are too large to be used, because of the

lack of room, and the only tool that can ben used is a ratchet. This power head requires less room than the ratchet. The drill or reamer fits into one end of the square socket F, and a small feed screw in the other. This socket is formed in a steel sleeve, which is keyed to the spur gear E, having 26 teeth, 5 pitch, and 1¾-inch face. The spur gear E is driven by



Right-Angle Power Head for Drilling and Reaming.

the steel pinion D having 14 teeth. On the same shaft with the pinion D, the steel bevel gear C is fastened. This gear has 36 teeth, 6 pitch, and 1¼-inch face. The main driving pinion B is made of hard brass, and it has 12 teeth. This pinion is keyed to the stub shaft G, which is attached to a flexible driving shaft. The shaft G can, of course, be driven in other ways if more convenient. The head frame A is made of cast iron, and each bearing is bushed with bronze. I believe that most shops will find this power head to be a valuable tool.—Machinery.

STOCK HOLDER FOR AUTOMATIC.

(By A. E. D.)

Herewith is illustrated a jig for making stock holders for the automatic screw-cutting machine. One of the principal things about an automatic is to have every part as near perfect as possible if you wish to avoid trouble. Holders are required for each size stock

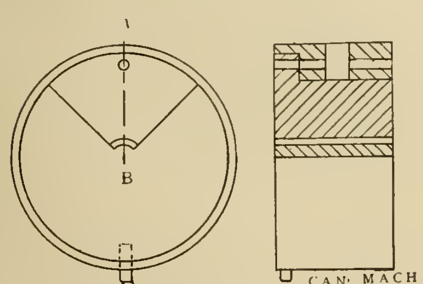
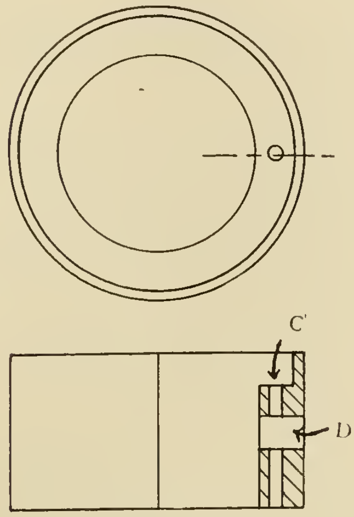
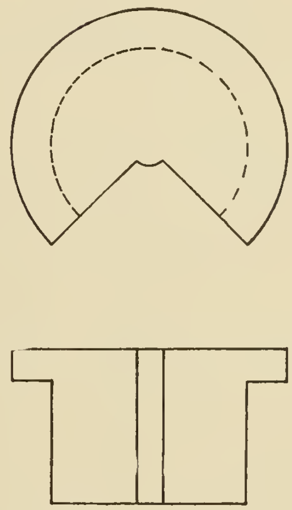


Fig. 1—Assembled View of Jig and Quarter.

and it is necessary that the stock holders should be the exact size to fit the machine and to hold the size stock for which they are designed. In a four-spindle machine four holders are required for each size stock so that a great number are needed if there is a variety of work to be done. The holder is turned on a lathe and cut into four quarters. Fig. 4 shows a top view and





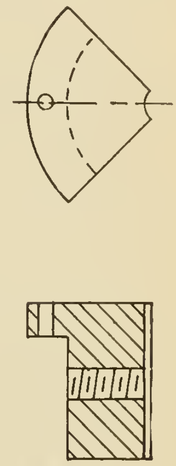


Fig. 2—Jig. Fig. 3—Centre Piece for Jig. Fig. 4—Quarter.

a section showing a tapped hole which is necessary for holders for square stock. This tap hole is used in fastening the quarter to the milling block. Before dividing, a hole is drilled in the centre of the holder the size of the stock for which the holder is intended, whether round or square stock.

Fig. 1 shows an assembled view of the jig complete with a quarter in place. The jig is used as a gauge for holders for round stock and a jig for drilling the tap hole in quarters for square stock. AB (Fig. 1) is shown in section on the right. In Fig. 2 is shown the jig, and Fig. 3 is the centre which fits into the ring (Fig. 2), being fastened in place by the pin shown at the bottom of Fig. 1. C is the gauge hole for drilling the hole in quarter, and D is for drilling tap hole in quarter. Top and sectional views are shown in Fig. 4.

In Fig. 4 the quarter is finished ready for milling for square stock. This is done by fastening the quarter securely to the block by means of the pin and stud shown in Figs. 5 and 6. Fig. 6 shows the quarter fastened to the block, which is gripped in the milling machine vise during the operation of milling. Fig. 5 shows the construction of the block on which the quarter is fastened for milling. The corners of the quarter are milled off to the lowest surface of the drilled hole and it is then ready for square stock.

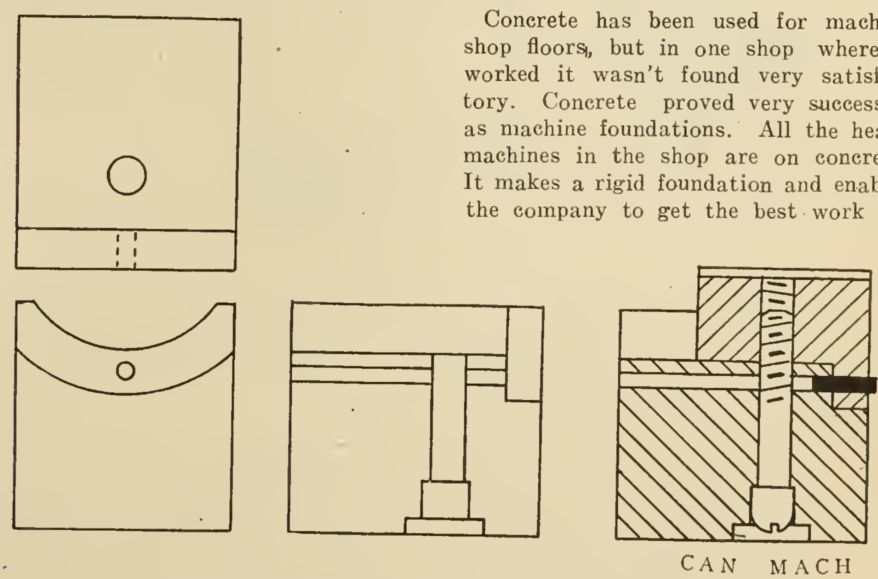


Fig. 5—Block for Milling Square Stock Holder.

CONCRETE FOUNDATIONS FOR MACHINERY.

(By G. Campbell.)

Concrete has been used for machine shop floors, but in one shop where I worked it wasn't found very satisfactory. Concrete proved very successful as machine foundations. All the heavy machines in the shop are on concrete. It makes a rigid foundation and enables the company to get the best work out of a machine. For fine work a rigid foundation is necessary, as it does away with all vibration.

To put in a foundation, dig deep into the ground to get below the frost line

and to reach solid earth. Build up the foundation with a wide bottom and finish off with cement to make it level. For such machines as drop hammers it is necessary to cushion the block with about eight inches of timber, oak being the most serviceable. It is found that engines and machines set firmly on concrete foundations, do not rattle nor get out of alignment. The machines run smoothly and there is no vibration to the building with the independent concrete base as there is when set on floor or timbers. Of course, the complete concrete floor does not give vibration, but we had to build a wooden floor over it and found it cheaper to build foundations only.

The foundations for the machines were built as the machinery was installed. When the floor was laid out holes were left in the foundations for the anchor bolts, with hand holes at the side. We used large square washers on the heads of the anchor bolts. As soon as the machines were in proper position we filled in around the bolts and underneath the machine where necessary to make it perfectly level, with a grouting of cement and sand. This manner of installing machinery is found much more satisfactory than any other way.

THE QUEBEC BRIDGE.

The engineers selected for the work of preparing plans for the reconstruction of the Quebec bridge are the best available in Canada, Great Britain and the United States. The Canadian representative, Henry E. Vautelet, C.E., Montreal, who will be chairman of the board, is a member of the Canadian Society of Civil Engineers, and until recently was in general practice in Montreal as a consulting engineers. He was for some years bridge engineer for the Canadian Pacific Railway Company. The British engineer selected, Maurice Fitz-Maurice, C.M.G., London, Eng., is chief engineer for the London County Council. He was formerly associated with Sir Benjamin Baker in the construction of the Forth bridge, and subsequently was in charge of the great Assouan dam in Egypt. The representative of the United States, Ralph Modjeski, Chicago, is a member of the American Society of Civil Engineers, and one of the most eminent bridge experts on the continent. These three men, all of large experience and of worldwide reputation, will be given a free hand in preparing the plans for the new bridge. They will begin their work as soon as possible, and will first examine the present piers and site, with a view to determining whether or not they can be made available for the new bridge. The present approaches, substructures and material on hand are now the property of the Government, in return for assuring the bond indebtedness of the Quebec Bridge Company, and are valued at nearly three million dollars, provided they can be used in the new bridge.

PERSONAL.

John Fensom, founder of the Fensom Elevator Works, Toronto, died at that city, aged 79 years.

Wm. Chaplin, vice-president and manager of the Welland Vale Mfg. Co., St. Catharines, Ont., died recently.

J. D. Macbeth, of the Canada Foundry Co., Toronto, was married to Miss Isabelle Annie Cook, on September 9.

Dr. Milton Hersey, president of the Milton Hersey Co., Ltd., Montreal, has endowed a fellowship in chemistry at School of Mining, Kingston.

W. C. C. Mehan has been appointed a superintendent on the G.T.P., with headquarters at Mellville, Sask. He was formerly superintendent on the Quebec, Montreal & Southern Railway.

Frank Clark, of the Cockshutt Plow Co., Brantford, was presented with a gold watch and chain by the office staff before he left for Regina, where he has been promoted to the position of cashier by the firm. General Manager Henry Cockshutt made the presentation.

Max W. F. Love, lately in the employ of the Record Foundry and Machine Co., Moncton, N.B., has gone to Fairbank, Alaska, where a good position awaits him. He was presented with a fob, chain and locket previous to his departure.

After fifty-five years in the employ of the G.T.R. as master foreman at Pointe St. Charles, Montreal, Mr. Adolphe Laprairie has resigned to live a retired life. Under the G.T.R. pension system, he will receive about $40 a month, and a free yearly pass over the line for himself and his wife.

W. G. Brownlee, general superintendent of transportation for the Grand Trunk Railway, has been appointed assistant general manager of the Grand Trunk. Mr. Brownlee will be succeeded on the Grand Trunk System by L. J. Ferritor, superintendent of the Wabash Railway at Peru, Indiana. Mr. Brownlee's new headquarters will be at Winnipeg.

W. F. Sutherland, who has been fifty-one years with the G.T.R., leaves the position of master car builder on account of the pension system. He is succeeded by John Hendry, of the Canada Car Co., an expert in his line, with a wide experience, having served in that position with Pullman, Chicago, and St. Charles Car Co., Missouri. He was presented with a mahogany box of one hundred pieces of silver and a gold-headed cane before leaving the Canada Car Co.

SOCIETY OFFICERS.

Canadian Railway Club, Montreal.

President, L. R. Johnson; treasurer, S. S. Underwood; secretary, James Powell, Box 7, St. Lambert, near Montreal. Meetings at Windsor Hotel, 1st Tuesday of each month, except June, July and August.

Central Railway and Engineering Club, Toronto.

President, W. R. McRae; secretary-treasurer. Room 409, Union Station. Meetings at Rossin House, 3rd Tuesday of each month, except June, July and August.

Canadian Society of Civil Engineers.

Rooms at 413 Dorchester Street West, Montreal. President, J. Galbraith; secretary, Prof. C. H. McLeod. Meetings will be held at Society Rooms each Thursday until May 1st, 1909.

Nova Scotia Society of Engineers, Halifax.

President, J. H. Winfield; secretary, S. Fenn, Bedford Row, Halifax, N.S.

Quebec Branch of the Canadian Society of Civil Engineers.

Chairman, E. A. Hoare; secretary, P. E. Parent, P.O. Box 115, Quebec. Meetings held twice a month at Room 40, City Hall.

Toronto Branch of the Canadian Society of Civil Engineers.

96 King Street West, Toronto. Chairman, C. H. Mitchell; secretary, T. C. Irving, Jr., Traders Bank Building.

Manitoba Branch of the Canadian Society of Civil Engineers.

Chairman, H. N. Ruttan; secretary, E. Brydone Jack. Meets first and third Friday of each month, October to April, in University of Manitoba.

Engineers' Club of Toronto.

96 King Street West. President, J. G. Sing; secretary, R. B. Wolsey. Meeting every Thursday evening during the fall and winter months.

Canadian Electrical Association.

President, N. W. Ryerson, Niagara Falls; secretary, T. S. Young, Canadian Electrical News, Toronto.

Canadian Society of Stationary Engineers.

President, Charles Kelley, Chatham; secretary W. A. Crockett, Toronto.

Toronto Branch A.I.E.E.

Secretary, W. G. Chace, Confederation Life Building.

CANADIAN RAILWAY CLUB, MONTREAL.

At the opening meeting in September, R. E. Johnston, Canadian Fairbanks Montreal, read a paper on Producer Gas Power Plants.

TORONTO BRANCH A. I. E. E.

The fall course of meetings was opened by an excursion to Niagara Falls, Ont., Saturday, Sept. 19th, where the plants of the three Canadian power companies were visited. In the morning visits were paid to the generating stations of Electric Development Co., of Ontario and the transformer stations of the Electric Development Co. and the Canadian Niagara Power Co. Lunch was served at the Clifton Hotel, after which the generating stations of the Canadian Niagara Power Co. and the Ontario Power Co. were visited.

If you don't look a gift-horse in the mouth, how can you tell how old he is?

DEVELOPMENTS IN MACHINERY

New Machinery for Machine Shop, Foundry, Pattern Shop, Planing Mill; New Engines, Boilers, Electrical Machinery, Transmission Devices.

A NEW TYPE OF BOLT CUTTER DIE HEAD.

This machine, Fig. 1, and especially the die head, Figs. 2 and 3, has been designed to meet the demands for a bolt cutter for high speed work and one that will give accurate results as well as admit of flexible rake in the die, accommodating the die to the various kinds of material that come up in daily practice.

The head is made entirely of steel, the heavier parts being made from cast steel, spindles from high grade machinery steel, and the smaller parts from tool steel. All the main bearing parts are hardened and ground and all interchange readily. The die head is symmetrical, very compact, and all parts are easily accessible. The die locks within the head and the yoke is not relied upon to hold the die closed while cutting or for carrying any of the cutting strain. In fact the yoke plays freely and is not locked at all. This makes it very simple for attaching to other makes of machines as well as requiring much less attention along the line of adjusting than is required by the average die head.

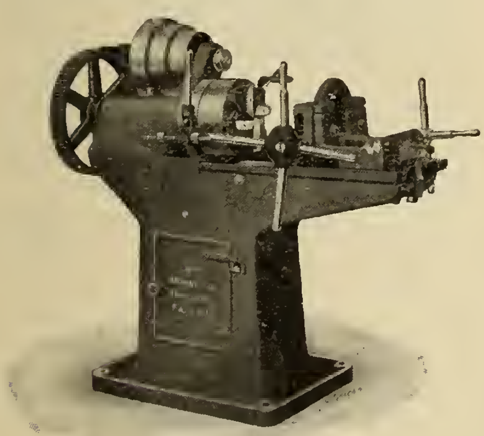


Fig. 1—Landis Bolt Cutter.

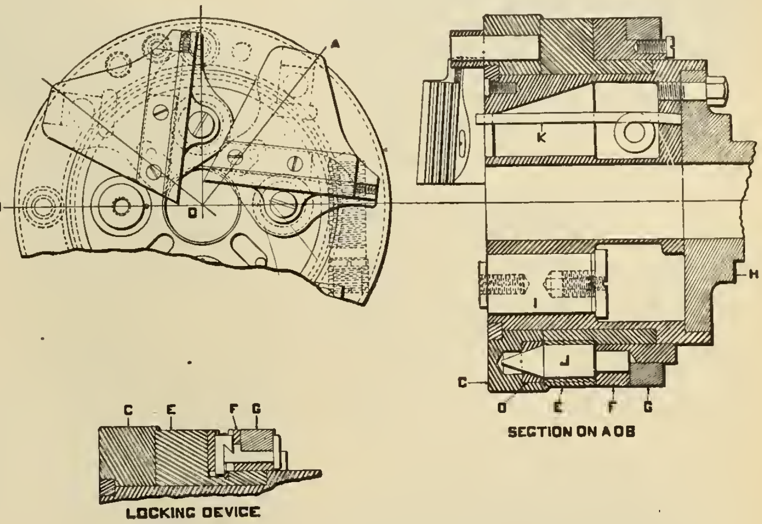


Fig. 2—Cross Section of Die Head.

The line cut, Fig. 2, showing a cross section of the head, shows a section on A.O.B., passing through one of the spindles, I, to which the chaser holder is securely clamped and which carries the greater part of the cutting strain. These spindles are ground and have very long bearings. The same section shows one of the large cone pins, J, which move longitudinally with ring F and work in hardened bushings in ring C to rotate same, which opens and closes the die.

Spring K engages the chaser holders and gives quick and positive opening to the die and at all times takes up the back-lash that might possibly occur from slight wear. This spring is made with one coil so as to give it a uniform tension in its different positions.

As shown in cut of locking device, to open the head, ring G moves back, raising the locking latches from behind their hardened seats, when the springs quickly open the die, and when the die is closed it is positively locked and there is no possible strain on the yoke.

The tangent adjusting screw engages the head body proper and is located in ring E. Graduations on rear of head determine setting positions for different diameters.

Spindle H of the machine proper is fitted into the head in such a manner as to make a rigid job and avoid any possibility of the head working loose from the spindle.

The vertical pin in the locking device with the angle head, drops in behind a hardened plate and is held there by a flat spring in ring G. In opening, the ring carrying the horizontal pin starts to move back, raising the vertical pin until it unhooks behind the hardened plate, and the die quickly opens. There are two of these locking pins located on opposite sides of the head.

Spindle I acts only as a support to carry the cutting strain of the die. The die is opened and closed through the actuating of ring C. This ring is in turn operated by cone pins J, one being located on each side of the head. When this ring rotates, the sliding shoe in the chaser holder moves the chaser holder back and forth at its perifery, causing the die to open and close from a central point.

The holders carrying the dies are also made of steel. Fig. 4 shows one of these holders with chaser in position and the small hook gauge used for determing the correct cutting position of the chasers after grinding same. The chaser is supported close up to the cutting point and is backed in such manner as to prevent any canting or becoming bell mouthed.

A clamping bar engages dove-tailed slot in the back of the chaser in such a manner as to draw it down and back at the same time by means of the two screws shown on the face of the chaser holder. Chaser is also supported on the rear by a screw which helps hold it in correct cutting position. By means of this screw the chaser can be set forward as fast as worn or ground off.

Any rake can be given the dies in grinding that may be desired to suit the kind of material you may wish to cut. This rake can readily be ground to get a rolling chip at all times, the same as would be procured from a lathe tool. This flexible rake makes it easy to acquire the highest possible cutting speeds that can be had from any die, as the cutting clearance in the die is cor-

rect and there is no possible drag in the die.

The bevel in the chaser, as shown in the cut, forms the throat of the die, and no grinding is ever done on this bevel at all. The depth of the throat can be made to suit special requirements, where it is necessary to cut close to shoulders or heads of bolts. You can cut just as close to shoulder when the die is almost worn out as when it is new, as we never grind it in the throat.

Fig. 3—The Die Head.

Chasers are hard their entire length and to resharpen means a simple grinding operation, which grinding is at all times done on the ends of the chasers, and very many grindings can be had on one set of dies before they are too short to hold.

These dies can be made especially to advantage from high speed steel, as they never require to be annealed, hobbed or retempered, thus eliminating much of the annoyance common in the hobbed die. Aside from this fact they have a life far in excess of any other.

Another feature of especial value in this die to which attention has been previously called is the fact that the back teeth can not snave the thread, but the back teeth of the four chasers act as a lead nut to draw the work in correct to the pitch of the die, and if required, special dies will be furnished, with a fine degree of accuracy guaranteed.

Fig. 4—Die Holder and Chaser.

With this die, cutting speeds have been procured more than 100 per cent. in advance of the ordinary hobbed die, due to the fact that the die has correct cutting clearance, flexible rake, and does not have any drag, giving the most ideal cutting conditions that can be had on any tool.

The die is opened and closed in much the same manner as in all ordinary bolt cutters, either by hand or by the movement of the carriage.

The carriage has special advantages of adjustment, either up or down or sidewise. It is gibbed to the bed in such a manner that it can be readily adjusted to compensate for any wear that may occur. The vise has guides centralized over the bolt being cut, with clamping screws immediately below, thus eliminating side thrust. The rack is central of the machine and immediately below the line of the bolt being threaded, and the grips provided with the machine can be turned four ways for holding different sizes or shapes of stock.

The main spindle of the machine is so arranged that any oil running in through the head can not run out on the floor in the rear, but will pass back into the oil tank again.

Fig. 5—One of the Chasers.

All machines are provided with rotary oil pumps with spring release valve.

When desired, tap chucks can be put on the heads in place of dies, to form chucks for holding taps, and one set of chucks will cover the entire range of the machine and can be adjusted in the same manner that you adjust the head and set the dies to different sizes, and it is not necessary to stop the machine to take a nut out or put one in again.

These machines are built by the Landis Machine Co., Waynesboro, Pa., U.S. A., in single, double and triple heads, with either belt or motor attachments, and the same type of die is also used by these people in their pipe-threading machines.

AUTOMATIC GREASE CUP.

A company has been formed in Peterboro, The Peterboro' Lubricator Mfg. Co., Ltd., for the manufacture of a new automatic compressed steel grease cup. It was invented by John F. Lewis, Philadelphia, who sold his Canadian rights to the new company. The cup is fitted on the bearings and works automatically by compressed air.

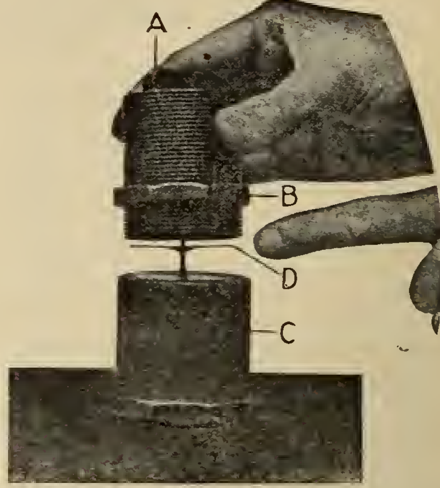


Fig. 1—Before Filling.

The method of filling the grease lubricator is as follows:

Screw the cup into place before filling, making sure that it is tightly screwed down, particularly on crank pins, or where there is unusual shaking. Unscrew and remove A; fill C even full with grease. There should be no grease at all in part A. Holding A as per Fig. 1, (with locknut B and disc D in the positions shown), screw it into C to the position illustrated in Fig. 2; or not to exceed one-quarter of its length.

Fig. 2 shows cup filled with grease, the upper part screwed into place. This will suffice for a run of from one week to a month, depending on the nature of the journal. In the bottom of the cup is a funnel, which draws the grease to the centre so that if the grease in the cup runs low and the cup cannot be at once filled, the surplus in the funnel will be sufficient to lubricate the journal until the refilling is done.

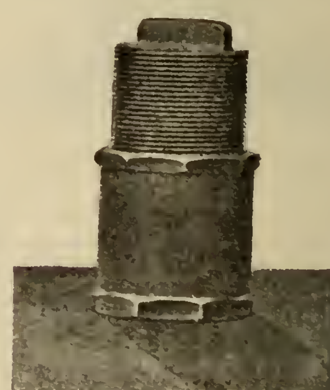
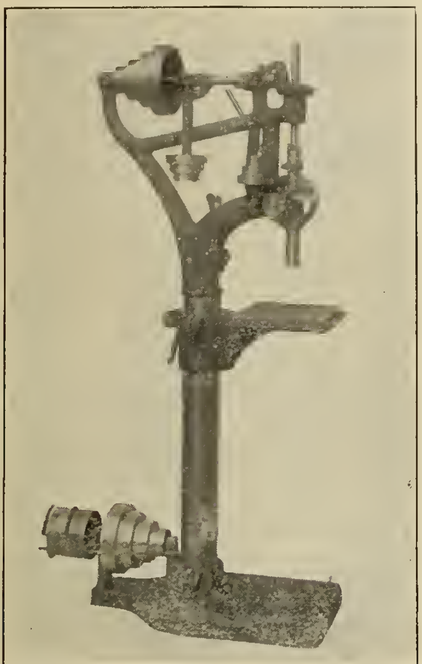


Fig. 2—Cap Filled.

NEW POWER FEED ATTACHMENT.

The accompanying illustration is of the 16-in. drill made by the Hoefer Mfg. Co., Freeport, Ill., which has a new power feed attachment. A slight departure from the regular method of attaching their power feeds has been made, which has proven a great success. In the design of the feed two worms are used to reduce the speed of the upper shaft to its proper feed for



New Power Feed Attachment.

the spindle. The pulleys are placed in a vertical position and the whole power feed is simple and very effective. To engage the feed a small lever is thrown upward and the worm is brought into mesh with the worm wheel. A trip is placed on the sleeve of the spindle, and the throwing out of the power feed is quickly and very easily accomplished. The speeds of the feed on the 16-in. drill for which this power feed has been designed, are: .004", .008", .012" per revolution of spindle, which has proven ample for all purposes.

The convenience of the lever feed has not been sacrificed in attaching this power feed, for the right hand is free to use the lever feed if desired, and a very handy and useful tool is the result.

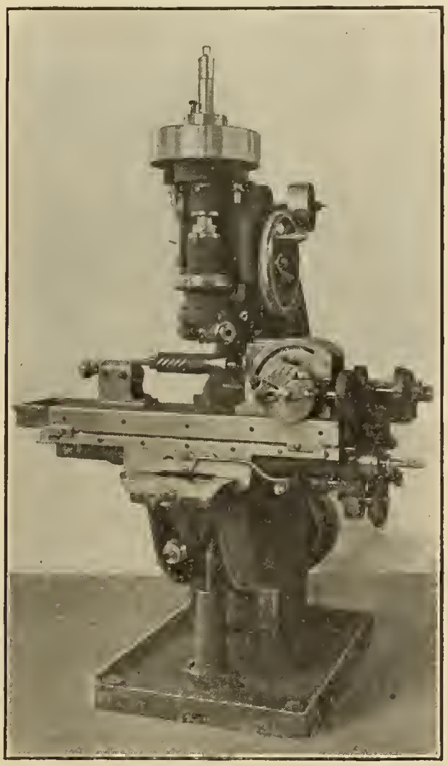
IMPROVED VERTICAL MILLER.

Improvements in the design and construction of vertical millers from time to time give these machines a wider field of usefulness. The Becker Milling Machine Co., Hyde Park, Mass., have introduced a horizontal attachment which in connection with the new dividing head makes possible the cutting of spirals, hobs, racks, etc., on the same machine that does the heaviest milling work.

The horizontal spindle, which is driven by the vertical spindle through the medium of bevel gears, carries the cutter at a point marking the intersection of the centre lines of these spindles. At the point of connection to the sliding head the adjoining surfaces are graduated so that the attachment may be set and clamped at any desired angle to the centre line of the platen. With this feature a plain machine may be used for the cutting of spirals and is universal in scope. The illustration shows the machine equipped for cutting a spiral.

As the cutter is set at the intersecting axis of the two spindles it is evident that the attachment may be revolved horizontally throughout an entire circle. Cuts can therefore be made either lengthwise or crosswise of the platen, or at any intermediate angle. Change of angle may be made instantly without disturbing any other adjustment on the machine.

The vertical miller with the horizontal attachment possesses great rigidity. A standard heavy milling machine is by this simple device turned into a universal machine in which no adjustment



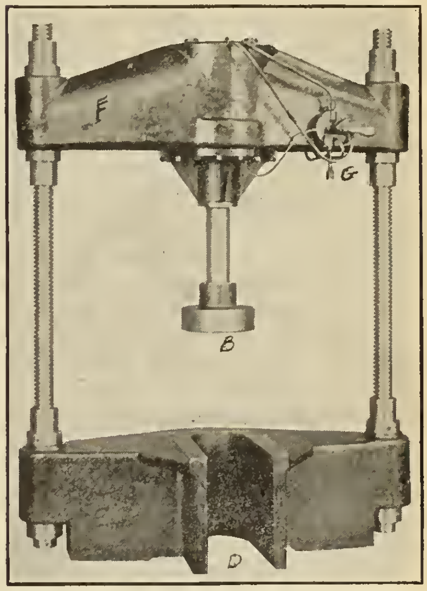
Improved Vertical Miller.

of the table is necessary. The full value of the long platen is, therefore, secured with its extended support. The excessive depth of throat in the vertical machine is of special benefit in providing ample space for the working of large pieces in any position on the platen. The dividing head used on these machines is of the standard Becker design and construction, driven through a train of gears similar to that employed on the horizontal machines of the same make.

SPRINGFIELD PNEUMATIC PRESS.

The accompanying illustration shows a pneumatic press designed and built by the Springfield Machine Tool Co., of Springfield, O., for use in their factory.

This tool has proven to be very use-



Springfield Pneumatic Press.

ful, and has recently been placed on the market by the company.

The description of the tool is as follows :

There are primarily two main frame castings, and two heavy upright screws.

The base "E" is of massive proportions, and is wide enough to permit a 40-inch diameter wheel to be laid upon it.

The opening "D," which extends back beyond the centre of the machine, and is for the purpose of making drives, where a portion of the work may extend below some considerable distance, as is the case in driving lathe spindles into face plate. It makes it easy in so far that the spindle does not have to be lifted high in the air and dropped through a hole, but merely set in the space "D."

The upper frame "F" is also very heavy, and contains in its centre a cylinder 12 inches in diameter, and permits of an 8-inch stroke; although if required the stroke can be made longer.

The piston head is fitted with three rings, which prevents air leakage.

The lower end of the piston rod carries a heavy shoe, "B," the central portion of which is filled with babbit, so that work will not be bruised when pressure is applied.

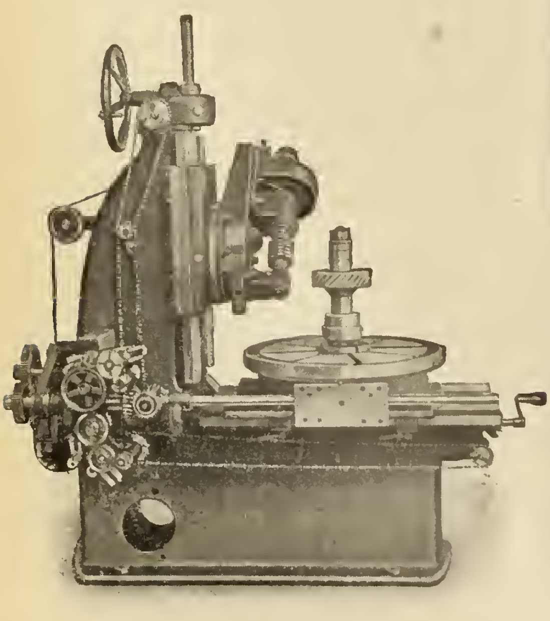
AUTOMATIC GEAR HOBBING MACHINE.

In this machine the hob keeps steadily at work from start to finish, and has several teeth doing work at the same time. The machine is automatic the only manual manipulations being to mount the gear blanks and remove the finished gears.

One hob is required for each pitch, the same hob cutting any desired number of teeth. The same hob cuts any number of teeth at any angle on a spiral gear of the same pitch. The hob has straight sided cutting teeth and is adjustable along its axis so that the whole length of the hob can be used before it needs to be sharpened. Ordinary single cutters can be used on this machine for cutting gears. The indexing is then done by hand with a special attachment.

The machines are made in several sizes and cut gears up to 104 inches, outside diameter. When hobbing a spur gear, the hob is first set at an angle relative to the axis of the gear cut, equal to the pitch angle of the thread of the hob. The table carrying the gear is fixed in a position to give the proper depth of the teeth. The proper change gears to rotate the table are selected for the number of teeth to be cut. The feed of the hob is downwards.

When hobbing a worm gear, the hob is set horizontal. The proper change gears to rotate the table are used. The table carrying the gear to be cut feeds



Automatic Gear Hobbing Machine.

towards the hob. When the proper depth of the teeth is cut, an automatic tripping motion stops the feed.

When hobbing a spiral gear the hob is set according to instructions furnished. The table carrying the gear is fixed in a position to give the right depth of the teeth. The proper change gears to rotate the table are used. The feed of the hob is downwards. A special train of differential gears are put in action.

The feed for the hob as well as the table can be operated both by hand and automatically; both are controlled by automatic tripping motion to stop the feed at the proper time. The feed screw on the table has micrometer reading.

The hobbing machine is manufactured by Schuchardt & Schutte, 136 Liberty Street, New York.

GLUE COOKERS.

The accompanying cut shows a 10-gallon glue cooker shipped to the J. B. Lyon Company, Albany, N.Y., by the Westinghouse Electric & Manufacturing Company. The West'nghouse Company builds a line of these cookers ranging

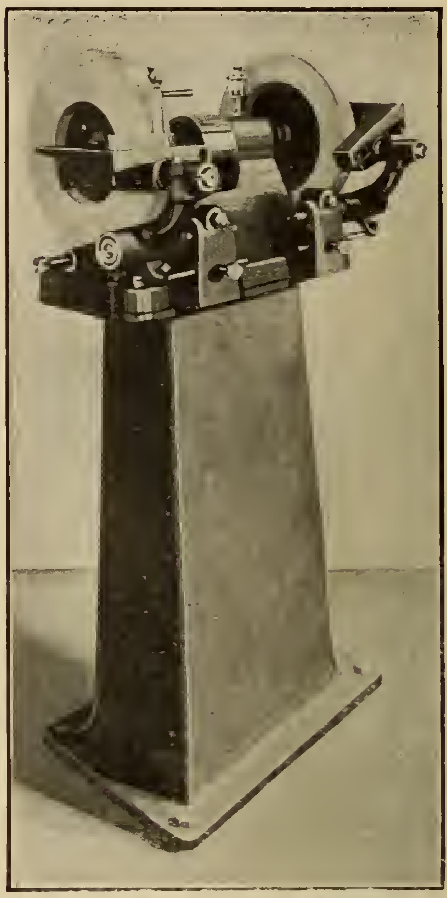
Glue Cooker.

from 5 to 25 gallons in capacity, and they are used by the manufacturers of printing press rollers, bookbinders and large cabinet workshops where it is necessary to melt and keep in working condition large quantities of glue or other compositions for replenishing the smaller glue pots used on the bench. These glue cookers are arranged with two heats, a high heat for melting down raw stock, and a low heat for holding the stock at a working consistency.

NOVEL FACE-GRINDING MACHINE.

This machine is designed for grinding lathe and planer tools, for edge grinding and squaring up ends of work, and for the general miscellaneous small jobs of grinding in the tool room and in the shop.

The machine is provided with a diamond for truing up both the face and periphery of the wheel. The manufacturers have provided a work table located in front of and extending by the edge of the wheel, so that both the



Novel Face-Grinding Machine.

face and edge of the wheel can be used for grinding. This table is located in a guide, carried by a transversely swinging arm, and in the end of the arm a longitudinally adjustable diamond holder is located. Normally the table can be either clamped to prevent any transverse rocking movement or adjusted to allow a certain amount of such movement, as is often an advantage in grinding wide work. When the surface of the wheel becomes dull or untrue an adjustable stop below the table is moved out of its path and the table swung backward away from the wheel, at the same time swinging the diamond across the face of the wheel so as to give the latter a good cutting and a straight surface.

This machine is manufactured by the Emmert Mfg. Co., Waynesboro, Pa.

POWER GENERATION AND APPLICATION

For Manufacturers. Cost and Efficiency Articles Rather Than Technical.
Steam Power Plants ; Hydro Electric Development ; Producer Gas, Etc.

APPLICATION OF ELECTRIC MOTORS TO MACHINERY.

By J. W. Helps.

The two chief reasons usually urged for the adoption of electric power in preference to any other are: adaptibility and economy. The former never has been questioned, but in very many cases economy is not achieved. Sometimes this defect is noticed, but more often it goes quite unobserved, to the disadvantage of the user, who has to be content with small profits where large ones are possible.

There are records unlimited to prove that in actual practice, electric driving can be very economical. Take one case —well known amongst electrical engineers because it was closely watched for results—that of the world-known firm of Richardson's, Hartlepool, Eng. They had 27 steam engines driving their works. These were taken out and a much larger number of smaller motors installed. The result was a net saving of 40 per cent. after making all allowances.

In practically every case where economy is not effected it will be found to be due to an unsuitable system of distributing the power, or the employment of inefficient gear, or of unsuitable types of motors. The points, therefore, which should be considered are: first, the source from which power is obtained ; second, the methods of driving; third, the types of motors to be employed ; fourth, the avoidance of the little things which militate safety, economy and general reliability in working.

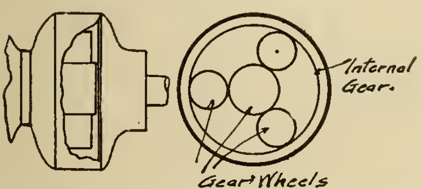


Fig. 1.—An Efficient Form of Reduction Gear for Direct Coupling. Slow Shaft in Line with Motor Shaft.

In the case of large works, where the amount of power used is considerable, it is usually most economical to install a complete generating plant. But for smaller factories, especially where power is procurable at a low price, it is generally advisable to obtain power supply from the central station.

Three Methods of Applying Power.

There are three general methods of applying the power, viz.: the single-unit system, where one motor drives the whole factory; the group system, where the whole machinery is divided up into small groups, each group having its own motor; and the individual motor system where each machine is driven by its own motor.

Excepting in the case of small shops where the total amount of machinery and of power used is small, the adoption of the first named method is nearly always a mistake. Power has to be carried from the motor to the driven machines by means of shafting, gear wheels and belting, all of which dissipate energy. It has been found that in many cases the loss amounts to 40 per cent., and in some cases as much as 68 per cent. of the power output at the motor. Again, this loss is far greater in proportion to the actual work done, when only part of the machinery is being used.

Grouping: In the case of small machines, each taking but little power, it is usually advisable to arrange them into small groups, several such machines being connected by belting and shafting as the circumstances may dictate, and having a separate motor for each group.

This eliminates the question of excessive first cost, which would have to be met if individual motors were used throughout. In such circumstances as mentioned its economy factor is very satisfactory. Amongst other cases where this method is correct the following may be taken as examples, viz.: the ruling, paging, stitching, punching, scoring and other small power machines used in the paper trades; separate lines of sewing mgchines in clothing works; and small drills, hacksaws, and the like in machine shops. It must be borne in mind, however, that the adaptibility of this method is limited exclusively to such instances as quoted.

The individual motor system: Save as mentioned above, this is by far the most economical method. It is also the most convenient, and, in the majority of cases, the only desirable way. Against the first cost of the motors, the absence of shafting and belts must be considered. But the question of cost is fully outweighed by the great advantages obtained.

Methods of Attaching Motors to Machines.

Generally speaking, the motor should be coupled directly on to, or geared into, the driven machine. This applies especially to such cases as the following, viz.: printing machines (particularly litho machines and those like the larger "Wharfdale" and "Meihle") printers' guillotines, paper-making machines and calendars; woodworking machines (particularly such as circular saws, planers, spindle shapers, and the like); spinning machinery and looms; and all machine shop tools, save the smallest. For the heavier kinds of machine shop tools direct coupling is, of course, indispensable.

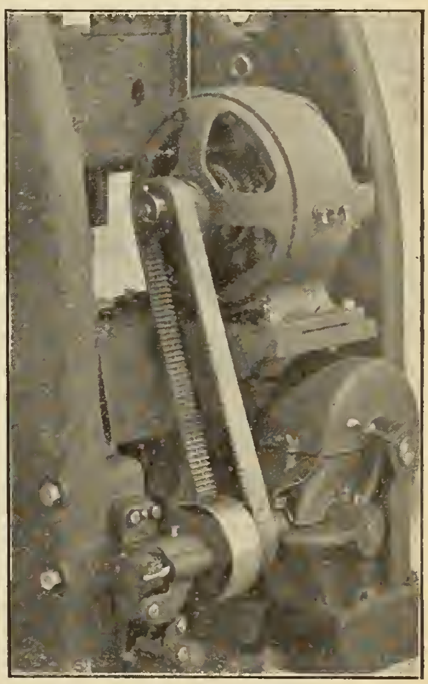


Fig. 2.—Chain Drive on Vertical Boring Mill.

A case which came under the notice of the writer recently will serve to illustrate. Motor had a belt drive to a line of shafting, which, with countershafts, ran two circular saws, bandsaw, three boring machines, small mortising machine and planer. The motor was built for 15 h.p., and should have been sufficient, but for the gear, but was found

to be overloaded. Eventually separate motors were installed, one for the planer, one for each saw, and one for the remaining machines, which were all connected to one short length of light shafting. The result, after allowing for interest on the outlay involved, showed an economy to the extent of nearly 30 per cent. of cost of electricity.

The method of attaching motor to machine is of great importance. Where possible, and particularly for high-speed machinery, the motor shaft should be coupled directly on to the machine shaft. But for other cases circumstances must dictate. Two methods worthy of special attention are those shown in Figs. 1 and 2: both are for speed reduction and both have been found to give satisfactory results. The "silent chain" drive needs no explanation. In the gear shown in Fig. 1 a pinion on motor shaft gears into three or more small gears, which in turn are geared into a larger wheel with internal teeth, this being keyed onto slow shaft. The housing for the gear is used as a base for the intermittent wheels (which should be of raw-hide) and also as a bearing for the slow speed wheel and shaft. This, if well made, forms a very efficient gear; the slow shaft is in line with motor shaft, and whilst a reduction of 20 to 1 is easy, there is practically no limit to its adaptibility.

Types of Motors to Be Used

We next come to the question of the type of motor,—whether for direct (continuous) current, or alternating current? If the former, whether series, shunt, or compound wound; and if the latter,

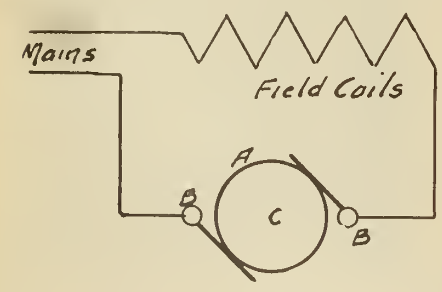


Fig. 3.—Series Wound Motor. A, Armature; B, B, Brushes; C, Commutator.

whether single phase or poly phase?

It is generally conceded that the D.C. motor is the most useful for general purposes, though it is closely pressed by the polyphase motor. An efficiency of 90 per cent., or even higher, may be attained with a D.C. multipolar motor of best design and manufacture—and it may safely be asserted that a cheaply-made motor is always very costly.

Series wound motors have the field coils, armature coils and external circuit all in series with each other, as in Fig. 3. The special features of such a motor are as follows' The "torque" (or "turning moment"—the "pull" of the armature) is greatest at starting; the speed varies inversely with the load, the current directly following the load. At light load it takes but little current, and runs at high speed. At heavy load the conditions are just the reverse — slower speed and greater current. Its high starting torque makes it specially useful for elevators, cranes, traction,

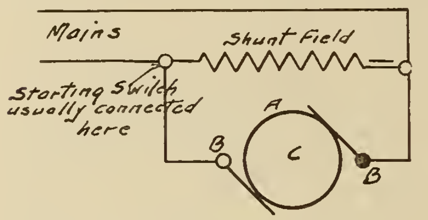


Fig. 4.—Shunt-Wound Motor.

coal-cutting, organ blowing and similar duties; but it is quite unsuitable for purposes where constant speed is required.

Shunt-wound motors are by far the most generally met with, since these are suitable for the majority of machinery requirements. The field coil of a shunt motor is connected across the armature (Fig. 4), and the one special feature about such a motor is its constant speed at all loads, provided that the supply voltage be constant. If provided with a suitable starting resistance it will start up against load, but its torque is smallest at starting and greatest at full speed. It is suitable for running lathes, drills and most machine tools; for woodworking, printing and weaving; for fans, sewing machines, and in short, for every case where the load is steady and constant speed is required.

Where the load is jerky, or where frequent and sudden stopping and starting occurs, but where regular speed is also necessary we get the compound-wound motor, which combines, broadly speaking, the advantages of the series and shunt windings. A reference to diagram (Fig. 5) will show how this is achieved.

The field is made with two coils, one in series with the armature, the other in parallel, as in the shunt motor. It has a high starting torque; if well designed it will efficiently maintain a perfectly regular speed on intermittent loads, even in cases where sudden thrusts are entailed, and will work at considerable overload when necessary.

Compound motors are largely used for elevators, though some engineers use series machines for this purpose. They are also largely used for pumping, and for direct coupling to motor mills, shearing and punching machines and all cases where the machines are very heavy and consequently great starting effort is called for.

Alternating Current Motors.

We now pass to the question of alternating current motors, single phase and polyphase. But first of all, a little explanation as to the terms "alternating" and "phase."

In a dynamo, the armature revolves in a magnetic field, each armature coil passing, in rotation, first the north and then the south pole. The result would be a current varying in direction but for the presence of the commutator, which rectifies it. In the alternator, however, no such rectifying arrangement exists, the coils of the armature, or "rotor" being connected with exterior circuit by means of collecting rings.

The stationary magnet coils Fig. 6) are excited with a direct current from a dynamo. When rotor is in motion an induced current will be set up in the secondary coils (Fig 6) attached to rotor. But as each secondary coil passes through alternately a "north" and "south" magnetic field, the current in each coil will vary in direction. Commencing from O it will rise to positive as the coil comes directly opposite to the first primary coil, then as the coils pass, dropping to O again, and when the next coil is reached, going to full negative. This would be a single-phase system, and is illustrated by the curve p in diagram—(Fig. 7).

A complete "cycle" or period is covered as shown in diagram, from c to c,

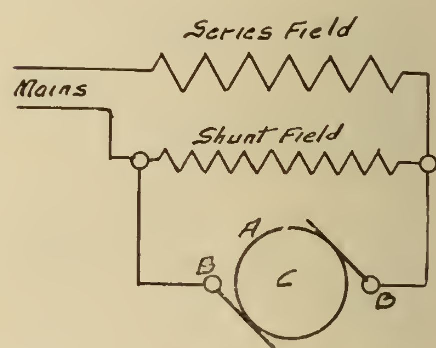


Fig. 5.—Compound-Wound Motor.

and it will readily be seen that the number of such cycles per second is dependant upon the speed of the machine and the number of coils.

Observe, however, that there is a point in each "cycle" when the coils in rotor are not opposite to any primary coils. Now, suppose we insert another set of coils, separately connected, in the spaces between the secondary coils shown in Fig. 6. Then we shall have a second current set up in these coils as they come into position, and as well as the curve p we shall have p2. This

would constitute what is known as a 2-phase system. By proceeding further in the same way we may get a 3-phase, or even 5-phase system.

The history of the rapid development of alternating current machinery is most interesting, but we are not so much concerned with that here. At the present day A.C. motors are of the "induction" type. A current is passed through the stationary coils in the field or "stator," and an induced current is set up

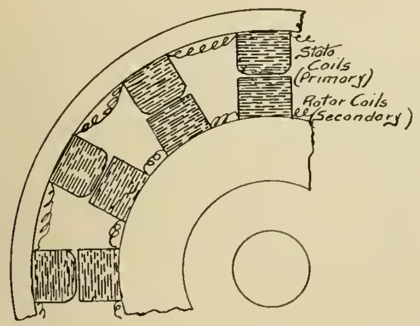


Fig. 6.—Arrangement of Coils in Single Phase Alternator.

in the "rotor," in consequence of which there is a reciprocal "pull."

Unless provided with slip rings or other devices, A.C. motors are of simple construction: there are no moving parts in connection with the external circuit, and save for the bearings and journals, no parts subject to wear and tear.

But the single-phase motor has some important drawbacks. It will not start up with any load—often a serious impediment, and one which in every case makes it an impossible motor for direct coupling. This limits its usefulness. Also it will not take an overload. Some English manufacturers meet this difficulty by underrating, e.g., a 5 h.p. motor will be marked and sold as 4 h.p., in which case an apparent overload is possible. But when a load is applied which is beyond its true capacity, the stress upon the motor will cause it to slacken speed. Now, it depends upon the speed for induction to take place at the right moment, corresponding with the "cycles" or periodicity of the circuit. Consequently, loss of speed throws it "out of step", the rotor loses its "pull," and stops.

The starting difficulty can be modified, however, even if not eliminated, by the introduction of some device which throws an added resistance into the rotor circuits at starting, and so increases the initial torque. This allows the motor to be started against some load. The magnitude of other troubles will largely depend upon the quality of design, workmanship and material in the motor itself. Once again, don't buy a cheap motor.

The polyphase motor is of modern introduction. A very few years ago it was scarcely thought of; to-day it is not simply an accomplished fact, but its adoption has become more general than was ever anticipated. The principles of its construction are much the same as in the single-phase motor, with the difference in windings corresponding to the difference between single and polyphase alternators, as already explained.

The difference in performance, however, is marked. It may be broadly stated that the polyphase motor combines the characteristic properties of the shunt-wound D.C. motor with those of the single-phase A.C. motor, without their disadvantages. It will start up against full load, will stand considerable overloading, will maintain a speed nearly constant, whilst it has no commutator or other moving contact parts, and the absence of wearing parts; consequently motors of this type have a great field and there are but few drives for which they may not be employed.

One more consideration is necessary. The life of the motor must not be too short or its repair costs too great. The frame should be designed not for cheapness, but to protect the windings, etc., as much as possible. It should be securely bolted to a solid foundation. Where direct coupling is adopted, the frame of motor should be secured rigidly to frame of driven machine.

The motor should also be protected as far as possible from dust, and especially from damp. It is an old and incontrovertible axiom that "dirt and damp destroy electrical machinery." Perfect lubrication and frequent and thorough cleaning of the motor is necessary. Sometimes—very seldom—it is necessary to apply a little vaseline to commutators, but don't pour oil upon them, or let them become perceptibly greasy.

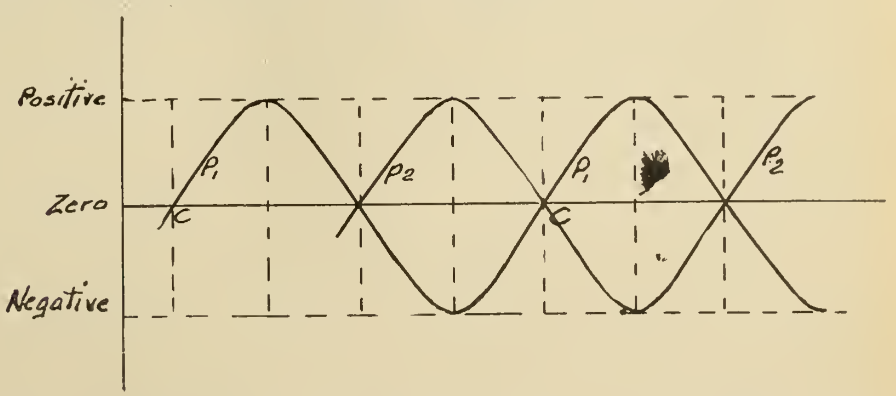


Fig. 7.—Alternating Current P.P.-Phases 1 and 2. C to C One Cycle or Period.

A Few Don'ts in Motor Operation.

Don't use cotton waste to wipe commutators with. Use a clean cloth.

Don't use emery on your motors at all. If it is necessary to clean commutators, use fine sand paper and polish with a piece of pine.

Don't overload your motors, it's bad policy everyway.

Don't have stiff or tight belts, or "lumpy" joints in your belts.

Don't let brushes press too heavily, or commutators will be worn into ruts.

Don't alter or remove brushes whilst current is on.

Don't let your motors become the resting places for "odds and ends."

Don't allow inexperienced persons to tamper with them, but don't neglect a fault until your motor suddenly burns out. As soon as undue sparking, heating or vibration is observed, call in a competent electrical engineer and let the fault be remedied, or it will certainly increase. A stitch in time saves nineteen.

CASTLES IN THE AIR.

A large part of the population is waiting for its ship to come in.

About every other man you see, and most of the women, are living in the future.

People who haven't the ability or the prospect of meeting next month's rent, enjoy beautiful apartments in an air-castle.

Hope—which is nothing more than a manifestation of the universal desire to live—becomes for a great many of us a soporific.

Now is the time. "Make good to-day —to-morrow you may not have the chance."

Living in an air-castle is about as beneficial as a meal eaten in a dream.

Wasn't it Cervantes who said that by the road of Bye-and-bye you get to the town called Never?

Beware of the man who is going to do things to-morrow.

He may mean well, but there's many a slip, and so forth.—Silent Partner.

CANADIAN MACHINERY
and Manufacturing News

A monthly newspaper devoted to machinery and manufacturing interests mechanical and electrical trades, the foundry, technical progress, construction and improvement, and to all users of power developed from steam, gas, electricity, compressed air and water in Canada.

The MacLean Publishing Co., Limited

JOHN BAYNE MACLEAN, President *W. L. EDMONDS, Vice-President*
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G. C. KEITH, M.E., B.Sc., Toronto - Managing Editor

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SUBSCRIPTION RATE.

Canada, United States, $1.00, Great Britain, Australia and other colonies 4s. 6d., per year; other countries, $1.50. Advertising rates on request.

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Vol. IV. OCTOBER, 1908 No. 10.

BUSINESS OUTLOOK.

There has been a perceptible change for the better in industrial conditions during the past month. A sudden jump to the conditions that existed during the first nine months of 1907 cannot be expected, but those who seem best qualified to judge say that it will take time to recover the lost ground, but the tide has turned and there is every hope and indication of business conditions improving with a slow but steady growth.

A prominent dealer in machinery and railway supplies, Montreal, writes:—"We are expecting an increase of Fall trade this year. Our business entirely depends upon our new developments and opening of new works. As soon as the scope of trade increases we are the first to feel it, as being supplyers to the manufacturers themselves."

Some factories in Quebec which were closed down are again starting work. The steel rail mills at the Soo are reopening and the steel mills in the United States are taking on hands who were laid off. Judge Gary, President U.S. Steel Corporation, visited Montreal last month and pointed out that the industrial situation in the United States is improving. He anticipates that improvements will continue during the Fall.

The general manager of the Royal Bank of Canada thinks Canada, and the West especially, is rapidly recovering from the depression. Conditions on the railroads are better now than they have been any time this year, and the G.T.P. has opened up 666 miles of western track from Winnipeg to Wainright, in the West.

The Dominion Coal Company has closed one of its collieries, but business in the plant and mines of the Nova Scotia Steel & Coal Co. is in a satisfactory condition, and the President stated that they were increasing their output and the outlook is bright. The manager of the Royal Bank, Sydney, states that business conditions in Nova Scotia are in a satisfactory state. The payrolls of the three large corporations, the Dominion Coal Co., Dominion Iron & Steel Co., and Nova Scotia Coal & Steel Co., together with the other lesser industries, aggregate over $1,000,000 in wages every four weeks. Some industries subsidiary to the Dominion Iron & Steel Co., such as the Dominion Tar & Chemical Co., Sydney Cement Co. and Saunderson Mfg. Co., are producing largely and are finding markets for all their output. Nova Scotia requires other secondary industries such as rolling mills and nail and car works. The business outlook altogether is encouraging.

THE TECHNICAL SCHOOL MOVEMENT.

For years we have been warm supporters of the Technical School Movement, and are pleased to note that the C.M.A. has taken active steps to interest the various governments in the scheme. The Quebec Government has established technical schools in Quebec and Montreal and the question is under the consideration of Premier Whitney. Technical education has done much to develop good farmers and acquaint them with the best modern methods. Why should it not do even more in building up other Canadian industries?

There is no nation in the world that gives greater encouragement and support to technical and industrial schools than Germany. The result is all that could be desired. The German workman in all lines of work have obtained a high proficiency in their different trades, thus contributing to the success German industries have obtained. It is to the benefit of each manufacturer to take an active interest in the formulation of a system of industrial education for our country which will place our industries on a footing with our competitors. We hope before very long to see in the principal towns and cities of Canada, schools that will assist the wage earner to work in a consistently larger degree with his head, and increase his usefulness in the economic world.

FIRE LOSSES AND THEIR LESSON.

When fire is an enemy it is a terrible one. Insurance provides compensation, but fire eats up capital as completely as if it was devoured by the ocean.

In the United States and Canada last month over $23,000,000 worth of property was destroyed by fire; and in proportion to population the Dominion was the greater sufferer of the two.

The losses in nineteen Canadian cities and towns alone contributed $5,831,000, or rather more than one-fourth of the total loss in both countries combined.

The four towns of Fernie, Sparwood, Michel and Hosmer in British Columbia that suffered from forest fires contributed $4,100,000 to the total. Other chief sufferers by fire in Canada last month were: Port Arthur, $500,000; Montreal, $90,000; Toronto, $140,000; West Toronto, $150,000; Gore Bay, $150,000; Newcastle, N.B., $100,000; Belleville, $67,000; Havelock, $41,000; Sault Ste. Marie, $75,000; Moncton, $30,000; Sayabee, Que., $30,000; Pottersburg, Ont., $150,000; Glencoe, $16,000; London, $107,000; Stirling, $750,000.

These figures are staggering and should impress upon business men particularly the importance of taking every precaution against fire.

Proper appliances, public and private, will do much in minimizing the possibility of conflagrations, but back of it all there must be carefulness on the part of those employed in factory, warehouse and store, for nearly all fires have their origin in carelessness.

FOUNDRY PRACTICE AND EQUIPMENT

Practical Articles for Canadian Foundrymen and Pattern Makers, and News of Foundrymen's and Allied Associations. Contributions Invited.

THE METAL SITUATION.

Steady improvement has taken place in the Canadian metal situation during the month. There has been no distinct spurt to business, but the volume of orders going through have been getting heavier in bulk. Consumers, although buying on conservative lines, seem more inclined to consider future requirements than they have been doing. But so long as there is no difficulty in securing metal as it is wanted, from the merchant, and prices give no sign of being unduly inflated, the present hand-to-mouth purchasing will more or less be continued. With the financial and crop situation showing up so well it is rather disappointing that the metal markets do not show signs of even greater stimulation, but confidence takes a long time to return, and although the industrial activity is greater, no user, rightly enough, is anxious to stock in large quantities.

Conditions have undoubtedly been dull in the primary markets. Improvement has been noticed, but it has not been consistent. It is slow and spotty and does not give much strength to quotations. In the States there is a decrease in idle cars and idle factories, but the railroads—the great factors of a strong market—have not been extending themselves in the buying line. Undoubtedly the railroads have been economizing to an extraordinary extent, but there is one consolation, that they must come into the markets sooner or later. The wear and tear of one year cannot be lost in the wear and tear of another. They have both to be accounted for. In the meantime the metal trades suffer from these economies.

Copper has not kept up so well this month as in former ones. There has been some speculation in the English market, figures at the commencement of September making a spurt, and although they dropped back again, the market has made very firm showing in view of the weakness in the New York situation which developed during the middle of the month. After continuing firm so long New York succumbed to the dull conditions and a sagging was noticed in all grades. There has been very little support to the market and if copper had been pressed for sale no doubt prices would have been forced down very much lower. The immediate future of copper seems very problematical. Trade in Canada has been fairly good, and quotations have continued to range from $14 to $14.50.

Tin has shown a weakening tendency throughout the month in the primary markets. There has been an absence of that strong bulling movement in London, so characteristic of other months. Here, too, conditions are very dull. New York is not handling so much metal, and the small jobbing demands are lighter than ever. In Canada, however, conditions are much better. A good volume of business has been done and orders have shown promising increase in bulk. Owing to this, prices have kept up well and have continued to range between $32 and $33.

Pig iron conditions in Canada have quietly but steadily improved, the demand during the month showing decided stimulation both for pig iron and finished materials. Local furnaces continue to do the bulk of the business. The heavier orders always made prior to the close of navigation for imported metal are now being booked. During the month pig iron, both in England and Scotland, made a strong advance, owing to a stimulation in the demand, but latterly the markets have weakened although Cleveland warrants continued at a good figure. Conditions in the States show signs of improvement. Some furnaces have raised their prices, and a better demand with higher figures is anticipated. The quietest feature of the market is in railroad materials.

Spelter during the month showed signs of greater strength in the primary markets. Although the metal, with so much production going on, appears to be in an unstaple position, there is a feeling of confidence underlying the markets which should not be overlooked. Producers have not been anxious to sell for future delivery, which is a good sign. With fair business, Canadian prices have been maintained at $5 to $5.25.

Lead has been very steady in the English market and this has had the effect of keeping up Canadian prices, which broke away a little at the commencement of the month. Trade has been fairly good in Canada, especially the last week or so, and prices for imported pig are firm at $3.50 to $3.60.

FOUNDRY WASTE.*

By Dr. Richard Moldenke.

In these times of serious industrial depression perhaps no subject should receive greater attention than the prevention of waste. In the rush of the high periods of our national prosperity all too often the maxim is forgotten that "waste makes want." In view of the present attempt to hold up the natural laws of supply and demand, we will undoubtedly have ample opportunity to take stock of the situation, and to apply every possible remedy in our foundry establishments until material and labor come down to normal conditions. As this eventuality may be considered a foregone conclusion, now is the time to plan improvements to do away with wasteful methods of manufacture. When the low level has been reached these improvements should be completed, so that when the next rush comes conditions nearer the ideal as we now know it may prevail and our prosperity be correspondingly enhanced.

Let me say at the outset that genuine improvements do not necessarily mean a cutting down of the wages of employes, but rather the opposite. Brains are worth money, but manual labor should be turned over to the coal pile as much as possible. The time is fast approaching when our knowledge of methods and materials will be such that what was formerly considered an art will be so simplified that men with less skill, operating on machines, will turn out as good if not a better product than is the case to-day. This will not hurt the present supply of highly skilled men, but rather enable them to turn their art to better account in higher positions.

In passing through many foundries I have often been tempted, on seeing the end of a lump of iron stick out from behind a lot of rubbish in a corner, to take a silver dollar from my pocket and ask the foundry foreman to throw it there also. The point is generally quickly understood, for there are several good dollars, even if in iron and not silver, lying idle and destined to be buried or lost in some other way. While in Pittsburg in my earlier days I usually had some 50 lbs. of dynamite on hand for use in

* A paper read at the convention of the Chicago Foundry Foremen's Association.

blowing up salamanders as they were unearthed in the foundry in making changes in the plant. From what one hears of the burial of accidents and mistakes in that city, its manufacturing districts must be veritable mines for salamanders and bad castings. This is the case doubtless in other cities, and yet every bit of that material should go into the cupola or basic-steel furnace. In short, the foundry foreman working in the interests of his employers can save quite a lot of waste in iron in the course of a year. Every foundry of any account should have an electro-magnetic separator for the shot made, as well as a slag barrel for the same purpose. I have known these separators to pay for themselves in three months, and saw one some time ago set up on the dumping pile of the foundry waste which was paying handsomely in iron recovered.

Who has not gone through the matter of saving the unburned portion of the cores used in the foundry and profited thereby? How many foundrymen will allow their foremen to experiment with binders and mixtures until the proper one is found giving the greatest satisfaction at the least cost? Yet unless this is done for every new set of conditions arising, there is a positive waste.

To take up the subject systematically we must first start with the general layout. If the means of communication in the foundry or manufacturing establishment are not at once simple and effective, no time should be lost in making them so, even if walls have to be cut, with a general rearrangement of the departments. This can be accomplished slowly and without disturbing conditions of work too seriously. Next proper light and ventilation should be provided. There should be no dark corners nor too convenient gates. An electric light plant of ample capacity is a good investment. The use of torches and dirty windows is waste. Heavy smoke induces cessation of work that has money value. Means should be provided to carry iron to every point in the foundry without breaking down men. In the larger shops small jib cranes save money in allowing a molder to handle his own work without disturbing everyone near him. All this comes under the head of equipment, which makes the first cost of the foundry higher, but saves labor, and thereby money. We could add to this air equipment for chipping, molding, cleaning and what not. These things you know of, and many installations can be bought on terms which practically allow them to pay for themselves. In such a case never hesitate to add them to the shop.

Perhaps the one thing to which the least attention is given is the molding sand and molding problem. Probably it is thought we can learn little more in these directions; but this is a serious mistake. We of all countries are farthest behind in the matter of preparing our molding sand. It is still too cheap. We sometimes buy ground sand because we think we are getting a better material, and yet find roots and soil in it. I venture to say that no foundry foreman is entirely satisfied with his sand. He would always like to have it better. Now, this is no fault of the sand man, for he gives his best. He even mixes and treats it for his customers so that they have the best possible chance for fine castings. The trouble is that we do not yet know enough about the physical constitution of a molding sand to give it the proper treatment. The ideal conditions are those in which any amount of pounding will not prevent proper venting, and yet the sand must be able to bond properly. At the same time it must be refractory to a high degree and stand repeated applications of melted metal without spoiling too much of it. The American Foundrymen's Association is giving considerable attention to this matter from the standpoint of the art of founding, leaving the practical application to the individual.

The greatest elimination of foundry waste ever brought about was through the introduction of the molding machine. Perfect as these machines are becoming, fifty years from now we will think those of to-day crude. Think for a moment how the success of a molding machine is tied up with the sand used on it. Correct this element of uncertainty, and a further step in the direction of the elimination of waste will have been taken.

The next greatest waste in the foundry is the loss through ignorance of the molder's art. The discount and time cards speak for this. What is badly needed is instruction day in and day out to the men engaged in molding, coremaking, and other occupations requiring skill. The foreman has his hands full with the larger questions. He cannot go into the small details, and yet from neglect of these the waste is great. The old custom of piling up the molder's bad castings for inspection at dinner time is a good one, but still better is an interview with him at his bench or floor by an expert specially engaged to do this under the foreman's direction. How many of our larger shops have this in operation?

In the larger classes of work the loss of pieces is small, but the time taken for molding is great. How often this could be cut down effectively by proper appliances. For small castings the usual custom is to pay by the piece, with perhaps a premium attached for extra efficiency. But how many bad castings are made which could have been saved by proper instruction, not to speak of the greater output per flask if the mixing and melting of the metal were made more perfect.

One of the most notable improvements I have seen in recent years is the desire on the part of foundry foremen and superintendents to acquire every scrap of information it is possible to get hold of. They have realized the importance of this far more quickly than their employers, and therein really lies the hope for future improvement in the industry. The foreman of to-day is just as able to calculate out a mixture as the chemist. He may not yet understand the action of the elements completely, but with the aid of night schools, by reading and asking questions, he will soon get all that he requires. The general movement for industrial education is not only the result of effort on the part of the employer, but also the willing acceptance of the idea by those who will eventually profit by it.

Taking more particularly the metallurgical end of the foundry, we find a direct waste in improper melting methods. How often have I found a 2,000-lb. charge consisting of the usual pig irons and scrap, and a 500-lb ladle to tap into. And then there was worry about porous or otherwise defective castings. To come right down to a question of daily practice: Inasmuch as the bed of a cupola coke charge is fixed by the desired capacity to hold iron and by the location of the melting zone (only the coke above the tuyeres being effective and the rest only so much filling to cool the iron rather than heat it), why is the first charge of iron used made so heavy? The melting of this lowers the coke bed seriously, and the second charge of coke does not bring it back to the place it had originally. Now as the iron and the coke come down in the succeeding charges this level may be raised again, even above the original bed, with the result that often the last coke charges must be reduced to get proper results. A much better practice would seem to be to make all the iron charges small, the first as well as the last, dividing the coke so that the proper ratio is kept for the whole run. This gives the smallest variation of the coke bed, and, as I have always found, the most uniform iron. After all, it would seem that our old foundrymen were not so far off when they first put in their bed of anthracite, then charged so many shovels of scrap, so many pigs, then some more anthracite, then metal again, all in very small quantities. They did make castings, that are our admiration for quality to-day, though we consider the melting method crude. I will only say that with even larger diameter cupolas, where the work has to stand water-pressure tests, and hence must be perfectly uniform in character, besides correct in

composition, the above method of very small charges of 500 lbs. of metal and the corresponding coke directly from the bed up gives excellent results where the old big charge method fails.

Now in cupola practice saving is in most cases waste. I strongly deprecate the attempt to get high melting ratios. The few pounds of coke saved always mean trouble in other directions. As long as the first iron shows from 7 to 10 minutes after the wind is put on, and the iron does not come too slow or hot at the end, it is better not to tamper with the coke ratio of the cupola in question. Similarly, to attempt to save 25 cents a ton in the mixture and increase the percentage of discards or the cost of machinery is a waste. Buying high silicon iron to mix with plough points may work all right, but usually means waste until handled right. Far better, if hard and soft irons are to be made in a day's run, to use high-grade ferrosilicon in the ladle.

It is incumbent on every foundryman to study his problem carefully, working hand in hand with his foremen, and making change after change on careful deliberation. Eternal vigilance is the price of financial success, and with safeguards placed about every process used, details put into responsible and intelligent hands, the supervision of a plant becomes a pleasure instead of a burden.

Chemical Reactions in Foundry Cupola Practice

A Technical Article going into the Detail Chemical Reactions—A Paper Presented before A.F.A., Toronto.

By JULES DE CLERCY, MONTREAL.

New processes, recently developed in view of obtaining motive power through the agency of gas engines driven with producer gas, have led engineers to give more attention than they had done heretofore, to the complicated chemical reactions taking place at different levels, in a large mass of incandescent fuel, under varying conditions, the results observed in the course of these experiments, happen to apply exactly to the conditions existing in the running of ordinary foundry cupolas. These conditions, as a matter of fact, are absolutely similar to those existing in coke or anthracite producers, considered as burning their own gas, instead of delivering it to a gas engine.

Let us first see what takes place in one of these producers, when run with a dry air blast. The incoming air, blown in through the tuyeres, or under the grate (which is the same thing) first meets a mass of previously heated incandescent coke. The oxygen of this air combines at first with the carbon of the coal or coke to form carbonic acid gas, as a result of the complete combustion of the coal or coke. This reaction is expressed by the following chemical equation:

$$C+2O=CO2$$

which means that the oxygen of the air combines with its equivalent of carbon, to form a volume of carbonic gas equal to its own. In other words, that 32 oz. of oxygen, calling for approximately 140 oz. of air, combine with 12 oz. of carbon to form 44 oz. of carbonic gas. One pound of carbon burning in this manner develops 14.500 British thermal units, i.e., a quantity of heat sufficient to raise the temperature of 14,500 lbs. of water one degree Farenheit.

The greater part of this heat is carried upwards by the gases of combustion and goes to heat the upper layers of fuel in the producer (or the layers of iron above, in the case of the cupola). The mass of fuel into which the tuyeres open and the zone immediately above them, soon reaches a high temperature which keeps on increasing up to a limit of say 1,600 degrees, or thereabouts, temperature at which carbonic gas can only form in very limited quantities.

The combustion goes on, nevertheless, but yields more carbon monoxide than anything else (16 oz. of oxygen, furnished by 70 oz. of air, combine with 12 oz. of carbon, to make 28 oz. of carbon monoxide). This imperfect combustion develops much less heat than when the carbon is burnt to carbonic acid gas, for one pound of carbon burnt in this manner only gives 4,400 B.T.U., instead of 14,500 developed by the same weight of carbon in the former reaction. More than two-thirds of the heat actually available in the fuel is lost, and in order to develop the same amount of heat as one pound of carbon burnt to carbonic gas, we have to burn 14,500 divided by 4,400, or about 3¼ lbs.

Notwithstanding this loss, there is nevertheless a considerable amount of heat being constantly developed, causing the temperature to go on continually increasing around the tuyeres, and unless a rapid exchange of this heat with some foreign substance is effected at this level, the temperature soon reaches 1,800 degrees and 2,000 degrees (temperature at which iron melts) and finally 2,300 degrees, at which temperature melted iron is rapidly oxidised, or in other words, burnt and made unfit for use.

Long before these temperatures are reached, however, the ashes contained in the fuel have begun to fuse, so that a producer running on coke or anthracite and with a blast of dry cold air, would soon become blocked, as the semi-liquified clinker will prevent the air from penetrating through the mass of fuel. Such a producer cannot therefore be run with a blast of dry cold air.

The coke and the anthracite contain a quantity of pyrites, or iron sulphides ; part of the sulphur in them is released at the high temperatures existing in the mass and this sulphur turns into sulphurous acid, the presence of which reveals itself by its characteristic odour of burnt matches. (In producers, where a steam blast is used, the free hydrogen combines with the sulphur to form sulphuretted hydrogen, which has an odor similar to that of rotten eggs).

The oxide of iron resulting from the decomposition of the pyrites, combines with the silica, lime and magnesia it meets with in the ashes and in the brick lining the cupola, and forms various silicates, or fusible glasses, which rapidly obstruct the producer and eat away the linings.

In order to prevent the obstruction of the producer in this manner, a mixture of air and steam has to be blown into it. This steam coming into contact with incandescent carbon at a temperature of from 1,600 to 2,000 Far. is entirely dissociated into its elements of hydrogen and oxygen. The oxygen at once combines with the carbon to form carbon monoxide and the hydrogen remains free. The formula expressing its reaction is the following:

$$HOs+C=2H+CO$$

2 volumes, or 18 oz. of steam combine with 12 oz. of carbon to give 2 volumes or 2 oz. of free hydrogen, and 2 volumes or 28 oz. of carbon-monoxide.

This reaction absorbs a considerable amount of heat, and does so in such a manner that if the proportions of air and steam are properly regulated, the heat developed by the combustion due to the air is entirely absorbed by the dissociation of the steam, and the temperature around the tuyeres will remain constant and can be maintained at a point such that clinkers will not melt, or even form at all.

Such is the theory of gas producers, viz., to maintain at the grate bars of the producer (or in the tuyere area for the cupola) a temperature sufficiently high to form a maximum quantity of carbon-monoxide, and yet sufficiently low to prevent the formation of clinker

and the rapid disintegration of the brick linings.

The gases coming from the producer, if it were possible to maintain its temperature at 2,000 degrees, would be carbon-monoxide and hydrogen mixed with the nitrogen injected with the air. This would constitute a comparatively rich gas. In practice, however, this is impossible, for the clinkers already become troublesome at 1,600 degrees, and it is always desirable to keep the temperature just below this point, especially in cases where the engine draws the air through the producer by the suction of the piston. The temperature being thus kept down, causes a considerable proportion of carbonic acid to form and enter the mixture of nitrogen and combustible gases. This makes a gas not quite so rich as the former, but it allows of the producer being run satisfactorily, and this is an important point to secure. Instead of injecting steam, carbonic gas could be used for the purpose and with the same advantages. In fact, some builders utilize the exhaust of their gas engines just for this very purpose. The gases so formed in a producer by the complete combustion due to the air, and by the reduction of the carbonic gas and steam meeting with no more air at the upper part of the fuel bed, can only burn in the cylinder of a gas engine, or at the orifice of the tuyeres in a furnace, after they have been mixed at these points with a proper proportion of air.

Let us now look into what actually takes place in an ordinary foundry cupola. In this case the temperatures are much higher; there is no fear of destroying the linings here, or rather, it is a necessary and unavoidable evil, and the inconvenience of obstructions caused by clinkers is done away with by making the blast sufficiently powerful to either go through or around them. Moreover, the iron being a base and largely in excess as compared to the acid silica, the silicates produced are more fusible than those met with in gas producers; the temperature being also very high, these silicates run quite freely with the iron on to the sand bottom of the cupola. If necessary, this fusion is assisted by the addition of fluxes to the iron.

These scoria are particularly abundant in the neighborhood of the linings, which they eat away and destroy quite rapidly. If the blast is a powerful one, the cold air coming in at the tuyeres, having a tendency to follow the line of least resistance, runs up along the sides of the cupola, cools them down around and above the tuyeres, and so sets or hardens the scoria coming down along the walls from the upper layers of the melting zone. From that time on a rim of hardened scoria forms around the tuyeres and especially above them. This rim or cushion keeps on increasing in size until it eventually stops the action of the cupola altogether.

If the cupola has only one run of tuyeres and the fuel is in small pieces the action of the air upon the coal will be absolutely the same as in the producer; a great excess of carbon monoxide will be formed, and about two-thirds of the heat actually available in the coal or coke will go out through the stack without having been turned to any use. If these gases were drawn off at the level of the charging door and sent into a gas engine the hour-horse-power could be obtained from 160 cu. ft. of it. Now, as one pound of carbon, burned to carbon monoxide, yields 80 cu. ft. of gas, it can readily be seen that for every pound of coke or coal burnt an extra half horse power hour could be produced and saved.

This is just what is now being often done in modern blast furnaces. In the case of cupolas, however, it cannot be done, and the loss and consequent waste of this heat is apparently beyond remedy. It is not the only loss made, either. The heat to melt the iron must be developed in any event, which means that 3¼ lbs. of coke must be burnt for every pound put to effective use. On the other hand, seeing that it takes only half as much air to burn carbon to CO as it does to burn it to CO2, it will readily be understood that ½x3¼ or 1.60 volumes of air will have to be blown into the blast to transform the coke into carbon monoxide, as compared to one volume only required to burn the fuel to CO2. This is an increase of 60 per cent. required in the supply of air, which means a corresponding increase in the power required to drive the blower whenever combustion to CO is going on. This, of course, is an illustration of an extreme case, because it is impossible to make carbon monoxide alone without making at the same time a certain proportion of carbonic gas.

This carbon monoxide may be seen burning as it passes the charging door, where it finds the air required to burn it; or else, whenever the draft is weak, the gas, not finding sufficient air in the stack, burns only at the top of it, where it spurts into a large sheet of flame, drawing protests from the neighbours, from the authorities and from the insurance companies. The above remarks are sufficient to show that the running of cupolas in this manner must be considered as an entirely unsatisfactory operation in every respect.

To secure more complete combustion, the blast is sometimes increased at a higher cost of power. If the fuel contains small pieces, and especially when it is coke alone that is being used, this remedy is not one at all and has no useful effect. If the coke is large, the air rushing more rapidly through the interstices, has no time to react as completely at the level of the tuyeres, there is less formation of carbon monoxide, and the efficiency of the combustion is improved somewhat. But the slag is cooled down to a great extent by the incoming air, especially around the tuyeres, where it causes the formation of a cushion of solidified slag around and above them. Moreover the general result is to produce uneven temperatures, causing oxidation of the iron and giving castings that are brittle and hard to work.

If large sized anthracite is being used, the reduction of the gases is still less rapid than with coke, and especially with light porous coke, because the surfaces exposed to the action of the air are much smaller in the case of the coal than in that of the porous coke. That is the reason why, in certain cupolas having only one row of tuyeres, better results will often be obtained with homogenous coal of sufficiently large size, or with a mixture of coke and coal, than could be secured with light coke, and better results, too, with a dense coke than with a porous quality.

Whenever the fuel contains small pieces, however, or if a porous coke is being used, it will become imperative to furnish an adequate supply of air to the upper part of the melting zone in order to completely burn up the carbon monoxide which will be formed. With a properly located second row of tuyeres, it should always prove possible to do away completely with the combustible gases which generally ignite and burn at the level of the charging door, and so give unmistakable evidence of defective operation in the cupola. But how is it that, upon visiting cupolas fitted in this manner, it is generally found that after a certain number of fusions the upper tuyeres have been put out of use in most cases? The reason is that it is an extremely difficult matter to place these tuyeres in the exact position they should occupy, and even then, to give them the proper dimensions. If they are made too large, they give an excess of air, which is worse still than incomplete combustion of the fuel. The air has a tendency to go through these tuyeres in greater quantities than through the lower ones; the lower part of the melting zone cools down and the upper tuyers get clogged with slag, which forms a circular cushion, projecting above them and finally grows in size, to the extent of separating the metal from the melting zone. The consequences of this are worse still than anything else.

The specific gravity or density of the fuel, its greater or lesser porousness

and its average dimensions, will, therefore, all be important factors in the problem of determining the position of these tuyeres. It was shown just now how, in the case of uniformly large sized anthracite, a second row of tuyeres should actually be avoided. It is, therefore, impossible to make a fixed set of rules to govern the design of a universal cupola to suit any and all conditions.

A cupola, just like a producer, must be designed to meet the particular requirements of the fuel it is intended to burn, both as to quality and as to dimensions.

The difficulties besetting this problem would be greatly reduced if it were customary to proceed in the same manner for a cupola as it is for a gas producer, viz.: if a suitable proportion of steam or carbonic gas were blown into the fire at the same time as the air; by this means a constant temperature, not exceeding very much that of melted iron, could be maintained with comparative ease at the level of the lower tuyeres, regardless of the size of the fuel; a large amount of combustible gases would be generated by the dissociation of the steam and by the reduction of the carbonic gas, as well as by the combustion of the fuel with air; (hydrogen and carbon monoxide); then, a secondary supply of air coming in through the upper tuyeres would burn these gases back again into carbonic acid and steam, thereby developing a large amount of heat.

The entire melting zone would thus be kept at an even and constant temperature of say 2,000 degrees, without any fear of its going any higher at any given point, where it might burn the iron and so deteriorate its quality and make it unfit for use. There would be no excess of cold air in any part of the zone and consequently, no tendency towards the formation of congealed slags around the tuyeres to narrow down the melting zone; the capacity of the cupola would only be limited by the resisting powers of its lining, which means that it would become from 10 to 20 times as large as that of cupolas blown with cold dry air. The complete disappearance of all slag blocking the tuyeres and interfering with the run of the cupola, would make operations extremely regular and sure; the volume and pressure of the blast could be reduced and a considerable economy realized in driving power for the blowers; the quantity of fuel per ton of iron turned out could also be reduced and, lastly, no flames would be seen either at the charging doors or at the top of the stack.

The conclusions to be drawn from the above are that the conditions most suitable for the proper operation of a cupola are the following:

Distribute the blast through several rows of tuyeres, with a view to securing as complete and perfect a combustion as possible of the carbon and of the combustible gases; keeping an even temperature throughout the entire melting zone, taking care to make the cross section of the upper tuyeres much smaller than that of the lower ones, so as to avoid sending an excess of air into the upper strata of the melting zone.

See that the position of these tuyeres varies according to the nature of the fuel, according to its degree of average humidity and according to its size, always bearing in mind, at the same time that any fuel will always act with regard to the blast in the same manner as if it were all composed of pieces of the smallest size it contains; also that anthracite and dense cokes will have a deoxidising power considerably inferior to that of light porous cokes.

It will always be advisable to mix in with the blast a stated amount of gases subject to being deoxidised by carbon at a high temperature, such as steam or carbonic gas. This will prevent the temperatures becoming excessive at points where the combustion is most active, and so preclude the possibility of burning the iron; it will also transfer any excess of heat existing around the lower row of tuyeres, to the upper strata of the melting zone, and in particular to that part of the fuel bed immediately in contact with the metal. As to the manner in which these auxiliary gases are to be procured, it is one of extreme simplicity, for all that is required is to draw them off from the upper part of the cupola itself, just beneath the level of the charging door where they are drawn off by means of an apparatus specially designed so as not to develop excessive temperatures in the blast piping. The result of this is to mix with the air of the blast not only the carbonic gas resulting from the combustion of the coke and the steam coming from the humidity carried by the fuel, but also a portion of the carbon monoxide, which is just so much more fuel saved, as well as a certain amount of B.T.Us. furnished by the apparent heat of all the gases.

These processes and reactions were turned to practical use by Mr. A. Baillot, and so far the results obtained by him, both in Europe and in America, in the various applications he has made of them, have been highly satisfactory. As much as 15 lbs. of iron have been turned out per pound of coke, bed included, and the iron has always been found to be of quite a superior quality. In fact, Mr. Baillot has realised in actual practice all the desirable advantages enumerated above and at the same time secured greater speed of melting and increased capacity of cupolas for a given size than was heretofore possible.

Malleable Iron Castings : Furnaces and Annealing

Types of Furnaces Compared; Materials Used for Packing; Physical Characteristics *

By C. H. GALE

Malleable iron is melted in the reverberatory furnace, the open hearth furnace and the cupola. The reverberatory furnace is the most extensively used, about 85 per cent. of the entire output of the United States being melted by this process. But little change has been made in this type of furnace since its adoption by the earlier manufacturers, beyond a marked increase in capacity. Prior to about 1885 the standard furnace was one of 5 tons capacity. This has been increased from time to time, until at the present time we have furnaces of 25 and 30 tons capacity, though furnaces of from 10 to 15 tons capacity are the most popular, and give more uniform results than those of larger capacity.

The adoption of the open hearth furnace for malleable iron dates back about 15 years. This type of furnace is now used largely and successfully in this district, more than 50 per cent. of the malleable iron made by the open hearth furnace being produced in the Pittsburgh district. This success, which has not always followed the introduction of this furnace in the malleable foundry, can be attributed to the local familiarity with this type of furnace from its extensive use in our steel mills.

The Several Types of Furnace Compared.

The open hearth furnace has many advantages over the reverberatory furnace, especially where the output is large, and orders guarantee a long, steady run, the chief advantages being cost of repairs and period of operation. A run of 300 to 400 heats without the loss of a single day for repairs is not uncommon. Then will come a shutdown of a week's duration for minor repairs and cleaning out, putting the furnace in condition for a like run. This long, uninterrupted run, to the operator of the reverberatory furnace, when customers are calling for deliveries, and who at the most can get but a week of uninterrupted service, or

*Presented before Pittsburg Foundrymen's Association.

12 to 18 heats from his furnace, seems like the dawn of the millennium.

After 1,200 or more heats the open hearth furnace will need a general repair, requiring four or five weeks, and here in the length of time required to make these repairs is where the reverberatory furnace has the advantage, it being a not uncommon practice during a busy season to rebuild the side walls, repair bridge walls and put in an entirely new bottom with the loss of one or at most two days' time. During a very busy season these repairs are frequently made on Sunday, thus avoiding the loss of a working day. Moreover, the reverberatory furnace can be charged within a few hours after these repairs are completed, while the open hearth furnace requires as many days to be brought to the required temperature before receiving the charge.

A heat of iron, after being melted and brought to the proper condition for casting, can be held in the open hearth furnace without injury for a much longer period than in the reverberatory furnace, not being subjected to the intense oxidizing flame of the latter, especially that produced by the use of the top blast.

Cupola melted iron does not possess the tensile strength nor ductility of iron melted in the reverberatory or open hearth furnace, due partly to the higher carbon and sulphur caused by the metal being in contact with the fuel. This feature is rather an advantage than otherwise, as most of the product of cupola melted iron consists of pipe fittings—castings that are not subjected to any great stress or shock. These castings are threaded, and a strong, tough malleable iron does not cut a clean, smooth thread, but rather will rough up under the cutting tool.

Annealing.

The annealing process for malleable castings differs from that of steel castings in that in the case of steel when recalescence, or the refining temperature, has been safely reached, it is needless or rather unwise to prolong the heat, while in malleable iron the annealing process has at this period but begun. This heat must be maintained for from two to four days, depending upon the thickness of sections of the castings under treatment and the compactness with which the castings or annealing boxes are placed in the furnace. The annealing temperature, 1,550 to 1,600 degrees F., is, however, not absolutely essential to thoroughly anneal malleable iron. This can be accomplished at a temperature as low as 1,300 degrees, but the time required will be at least twice that of the higher temperature.

There are but few concerns engaged in the business for any considerable time with whom there has not been tried out the process of annealing without surrounding the castings with a packing material, but the heavy scale formed on the castings and their general unsightly appearance, together with a refusal of acceptance on the part of the customer, soon convinces the experimenter of the folly of continuing the process. Malleable castings can be annealed without the aid of any packing material and still preserve their appearance, and without the formation of scale by placing them in an airtight receptacle excluded from the flame and gases in the furnace; however, as economy of production is the objective point sought, this process has nothing to commend it.

Material Used for Packing.

Until recent years the material in which castings were packed for annealing was composed of hammer and rolling mill scale, turnings, borings, etc. This was treated with a solution of sal ammoniac or muriatic acid to form a heavy coating of oxide. This method has, however, been nearly superseded by the use of slag. The slag that is skimmed from the bath of the melting furnace, when ground to pea size and smaller in a tumbling barrel, makes an excellent packing material. Care should be taken to cool this slag with water as it is being skimmed from the melting furnace, it being the custom in some foundries to use old sand with which to deaden the heat. Better results can be obtained from this slag in the annealing furnace if kept quite free from sand and dirt.

Many malleable foundries in the vicinity of blast furnaces, where granulated slag can be had at a small cost, use this for annealing, it being probably the most economical. Fire sand and fire clay are also used, fire sand being an excellent material where the castings are very light and of intricate shape. Such castings, when packed in sand, will retain their shape, even though the furnace be overheated. This sand, however, deteriorates very rapidly if not renewed. Experiments conducted without the addition of new sand gave the following results: First and second times of using gave good, well annealed castings; third and fourth times of using gave castings with a fair anneal, but showed a tendency to weakness; fifth time showed a still weaker casting, while the sixth and seventh times the sand was used produced castings of but little more strength than the original hard iron, and they had to be returned for reannealing. After the seventh time of using the sand resembled a heavy wood ash.

The theory of oxidizing the scale and borings that was adhered to so long was that the castings would become decarbonized by the oxygen in the packing material combining with the carbon in the castings, the large percentage of iron oxide in the furnace slag, about 50 per cent., being the principle that first led to its substitution for scale and borings, but that the presence of a large percentage of this oxide is not essential is proved by the results obtained when annealing with materials containing little or no oxide. Many malleable foundries where scale and borings are still used have discontinued the oxidizing of this material with sal ammoniac or acids.

Physical Characteristics.

The physical characteristics that give malleable iron its greatest value, and wherein it differs from gray iron, lies in its ability to resist shocks and an increased tensile strength. The degree of malleability in light and heavy castings varies. In a light casting $\frac{1}{4}$ in. thick and less, it means a soft, pliable condition and the ability to stand considerable distortion without fracture, while in the heavy sections, $\frac{1}{2}$ in. and over, it means the ability to resist shocks without bending or breaking.

The tensile strength of malleable iron varies with the thickness of the metal, the lighter sections having a greater strength per square inch than the heavier sections. This fact is now being recognized by engineers and at least one eastern railroad, which requires its malleable castings made in accordance with specifications, designates the tensile strength desired in its castings to be as follows: Sections $\frac{3}{8}$ in. thick or less should have a tensile strength of not less than 40,000 lb. per square inch; those of $\frac{3}{8}$ to $\frac{3}{4}$ in. thick, not less than 38,000 lb. per square inch, and those over $\frac{3}{4}$ in. not less than 36,000 lb. per square inch. In recent tests along these lines, test bars $\frac{5}{8}$ and $\frac{7}{8}$ in. in diameter were made in the same mold and poured from the same ladle, thus insuring equality of metal, and annealed together. The average tensile strength of five pairs of bars so treated, representing five heats, was: $\frac{5}{8}$ in. bars, 45,095 lb. per square inch; $\frac{7}{8}$ in. bars, 41,316 lb. per square inch. Average elongation in 6 in.: $\frac{5}{8}$ in. bars, 5 3-10 per cent.; $\frac{7}{8}$ in. bars, 4 2-10 per cent.

A very high tensile strength can be obtained approaching that of cast steel, but at the expense of the malleability of the product. The writer has seen malleable test bars having a tensile strength of between 60,000 and 70,000 lb. per square inch, but the ductility and ability to resist shocks of these bars were not equal to that of bars breaking at 40,000 to 45,000 lb. per square inch.

The Strength Not in the Skin.

It was formerly the general belief that the strength of malleable iron was largely in the white skin always found on this material, but it has frequently

been demonstrated that the removal of the skin does not proportionately lessen the strength of the casting.

The process of annealing is one of conversion of carbon, there being practically no change in the other elements. The carbon in the original cast state is all in the combined form, this being converted by the heat treatment to graphite. This graphitic carbon, however, differs from that present in pig iron or gray iron castings, a difference that is readily noticed by the chemist. Instead of being present in crystals or grains distributed throughout the metal, it presents itself in an amorphous state, extending through the metal in minute filaments.

Besides the conversion of carbon, there is also a partial elimination of carbon, the loss being greatest in the white skin, the carbon content of which will vary from 0.10 to 0.20, while the interior of the casting will have a total carbon of about 2 per cent. The percentage of loss of carbon is, however, not constant, varying with the material with which the castings are packed for annealing. With a carbonaceous material, as coke, the carbon loss is less than with slag or scale, while castings annealed in coke have a higher sulphur content than before annealing, due to the absorption of this element from the coke.

The following analysis will give a good average of the changes in the elements during the annealing process, slag and coke being used:

	Si.	S.	P.	Mn.	C.C.	G.C.
Hard iron—	0.63	0.043	0.147	0.21	2.54	Trace
Annealed in slag—	0.61	0.049	0.145	0.21	0.24	1.65
Annealed in coke—	0.61	0.065	0.150	0.21	0.25	2.00

The casting of direct malleable iron, thus eliminating the tedious and expensive annealing process, is a very alluring proposition to the manufacturer, but despite the best efforts of the founder and metallurgist it still remains an iridescent dream, holding in abeyance the fame and fortune of its discoverer until the solution of its fellow problem, the conversion of iron into gold.

Many a good name has been given the tar and feather degree by idle gossip.

A THRIVING INDUSTRY.

Messrs. John H. Hall & Sons, Brantford, manufacturers of tools and machinery, have completed the erection of a new machine shop, 90x40 feet. It is a two-storey brick building, with basement and concrete foundation. The basement is a large and airy one and is at present used as a storage room for castings and other material. The power and heating plants are built in the basement, which has a solid cement floor.

In the front on the first storey are spacious offices, adjacent to which is a stock room where a large and assorted stock of belts, shafts and pulleys is kept on hand. On the same floor the machine room, with various kinds of up-to-date machinery for general work, is situated. A feature of this department is a large driveway right into the room at the rear, where work can be done inside on traction engines and other heavy machines.

The upper storey is especially adapted for the designing and drafting work

New Plant of H. Hall & Sons.

which is carried on extensively by Mr. Hall and his expert staff. The room is also especially fitted for experimental work. The power to run the machinery is derived from natural gas.

The firm consists of Mr. John H. Hall, who is the leading member. He has conducted the business for the past five years. Previously he had a long and varied experience in just such work as his shop is doing at present, viz.: tool making. He first learned the trade of machinist at the Waterous Engine Works, later assuming charge of the tool department at that shop. For a number of years he was also foreman of the Massey-Harris Company and Brantford Bicycle Company's tool departments, in which work he was always considered an expert. Assisting Mr. Hall are his sons, Messrs. E. W., E. L., L. G., and A. R. Hall, each of whom is an expert machinist, excepting E. W., who has charge of the office, with a capable knowledge of drafting work.

Special machinery, including bolt and pipe-threading machines, are designed and built by John H. Hall & Sons. The firm specializes in the manufacture of tools and light machinery, but the new shop will accommodate the heaviest machinery requiring repairs. In addition, the firm will carry stocks of transmission supplies, including belting, hangers, pulleys and shafting.

Information Furnished.

A prominent railroad man hurried down the lobby of a Binghamton hotel and up to the desk. He had just ten minutes in which to pay his bill and reach the station. Suddenly it occurred to him that he had forgotten something.

"Here, boy," he called to a negro bellboy, "run up to 48 and see if I left a box on the bureau. And be quick about it, will you?"

The boy rushed up the stairs. The ten minutes dwindled to seven, and the railroad man paced the office. At length the boy appeared, empty-handed.

"Yas, suh," he panted breathlessly. "Yas, suh, yo' left it, suh."—Everybody's.

The man who doesn't ask favors gets most of the world's.

The man who kills time kills his chances in life.

The young man who always reads the sporting page first will never set the world on fire.

INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News.

Machine Shop and Foundry News.

Dennis Mahoney's foundry at Cornwall, was burned early in September.

The Belleville Brass Works report orders coming in well. Thirty-five men are employed.

An addition will be built to the spike mill of the Hamilton Steel & Iron Co. at Hamilton.

The Vulcan Iron Works will remove to a new site on Lulu Island from New Westminster.

G. P. Clapp and J. Eatough, of Montreal, will establish a tack and nail factory at Galt.

The Phoenix Bridge Company, Montreal, is erecting an addition to its machine department.

Begin Bros., foundry at Windsor Mills, Que., was burned Sept. 5, and $3,000 damage was done.

The Miramichi Foundry, Chatham, N.B., is the only bridge-building plant in New Brunswick.

Tolton Bros., Guelph, manufacturers of agricultural implements, will build an addition to their works.

Thomas Gall, Kincardine, was awarded the contract of building the extension to the Hunter foundry.

The T. & N. O. Railway Commission will build a car repair shop and a pipe and casting shed at North Bay.

Howard & Cohen, stove manufacturers, Morrisburg, Ont., contemplate locating their works at Sherbrooke.

Delahaye Bros., Pembroke, have bought the plant and stock of the Canada Stove Co., Ottawa, which recently assigned.

The I.C.R. shops at Moncton are nearing completion and it is expected that they will be handed over to the I.C.R. by October 1.

The power house for the Doty Engine Works, at Goderich, is nearly completed, and work on the main building will be commenced at once.

The Carrier, Laine & Co.'s workshops at Levis, Que., have been purchased presumably for the I.C.R., which will erect machine and repair shops there.

The C.P.R. has placed an order for 85,000 tons of rails and the G.T.P. will place a large order soon, both with the Lake Superior Corporation at the Soo.

Stevenson & Edwards, late of Galt, have bought out the machine shop of Beaty & Co., Milton. They are both highly skilled mechanics and engine experts.

The Siliver Car Company's foundry at Halifax, is now in operation. It is thoroughly equipped, and can turn out any description of castings or forgings.

Joseph Wheeler and Stephen Bros., of Sydney C.B., have opened a mechanical and electrical repair shop at Sydney. They will do all kinds of mechanical and electrical jobbing.

A. Thomas & Fils, boiler makers, Levis, Que., have dissolved, but the business will be continued by Alex. Thomas, jr., and the firm's name will remain unchanged.

The Louden Machinery Company will build a new plant for the manufacture of hay carriers and other stable machinery at Guelph. The plant will include a moulding shop.

The Ottawa Car Works will build the cars for the Edmonton Street Railway. The new cars will be vestibuled. Seven will seat 40 persons, have double trucks and four-motor equipment and one for use in Strathcona alone will seat 32 persons, and have two-motor equipment and single trucks.

The large machine shops and blacksmith shop of the Dominion Copper Company, adjoining the Boundary Falls, B.C., smelter, together with the entire machinery plant, was destroyed by fire. The destruction of the machine shop will mean a big loss to the company, as it was fully equipped with the most modern machinery for repairing, etc. The building will probably be rebuilt.

W. S. Fisher, of Emerson & Fisher, wholesale hardware merchants, proprietors of the Enterprise Stove Co., Sackville, N.B., with his son is in Chicago getting ideas for his foundry building and equipment, which was completely destroyed by fire a short time ago. The new plant will be erected on the site of the former foundry and it is hoped to have the buildings ready for occupancy by December 1st.

At the pipe foundry, at Londonderry, N.S., the new plant for casting ingot molds is about completed, and trial casts will soon be made. Should these trials be successful, it is understood that the plant will be considerably enlarged, as there is a big demand for these molds. Mr. Kilpatrick, the general superintendent, is expected at Londonderry, to be present during the experimental stage of the new industry.

Four Peterboro' gentlemen of large industrial experience have formed themselves into a syndicate to acquire and operate the business and plant of the William Hamilton Manufacturing Company, boiler, sawmill machinery, turbines, etc., at that place, now owned by the A. R. Williams Co., Toronto. If the property cannot be got at a reasonable figure from the latter, the syndicate will erect and equip new buildings and carry on a similar line of manufacture.

News of Electrical Undertakings.

Considerable extensions are planned by the Molesworth, Ont., Telephone Company.

The Central Electric Company, Portage la Prairie, will instal $30,000 worth of new machinery.

By a vote of 117 to 31, Lethbridge ratepayers passed a by-law to purchase an electric light plant.

The electric light plant installed at La Patrie, Que., a number of years ago is to be put in operation again.

Calgary's additional power plant is almost completed. This will [illegible] more horse power to that city.

The W. O. Pinder Co., of Seattle, is installing an electric lighting system at the Fraser River Sawmills, Millside, B.C.

$25,000 will be spent by the Manitoba Government for the improvement of the telephone system at Portage la Prairie, Man.

The Water Commissioners of Lindsay are contemplating the installation of electric energy in the pump house instead of steam.

The Saskatchewan Government since taking over the telephone system of the province, has let contracts for 400 miles of new line.

The Trenton, Ont. Electric & Water Company are planning a large water power development. J. J. Wright, of Toronto, is manager.

The Western Saskatchewan Telephone Company are making arrangements to build a line between Drinkwater, Sask. and Belle Plain.

Streetsville, Ont., recently installed a municipal electric lighting plant at a cost of $26,000, and is now supplying current at 6 cents per kilowatt. This is the lowest rate in Ontario.

The town of Boissevain, Man., contemplates installing an up-to-date light plant, and have appointed W. E. Skinner, electrical engineer, Winnipeg, to look after the work.

Hunter Bridge & Boiler Co., Kincardine, are erecting a large building of concrete and steel for the accommodation and development of their increasing business in bridges and boilers.

The B. C. Electric Railway Company has started up its steam plant at Victoria to augment the power from Goldstream, until the reservoir is again replenished with fall rains.

The Montreal Light, Heat & Power Company ask for the renewal of its contract with the city at $75 for arc lights, which is $15 more than the present rate; and $24 for incandescent lights, $9 more than at present.

The electric lighting plant in Leamington, owned by Stars, Reid & Post, has been sold to Detroit capitalists. The price paid is said to have been $25,000. The new owners intend to make extensive improvements in the plant

The Galetta Electric Power & Milling Company, has almost completed its power station at Galetta, and is erecting a pole line to supply Arnprior with light. Fitzroy, Huntley, Kilburn and Carp are also looking for light from the company.

The range of the Independent Telephones in the Markham, Ont district, will shortly be still further extended by connection with the Uxbridge and Scott Company's line, and the extension of the Bethesda and Stouffville Company's line to Richmond Hill.

Some of the prime movers of the proposed Pine River Electric Power Co., at Shelburne, Ont., looked over the proposed power site at Horning's Mills, which is proposed to supply electric energy for light and power purposes for Shelburne, Orangeville and Grand Valley.

A very important agreement has been concluded between the Chatham Gas Co. and the Chatham, Wallaceburg & Lake Erie Electric Railway, whereby the former will supply from their own power house all the electric power necessary for the running of the entire railway system from Wallaceburg to Lake Erie.

The tender of the Canadian Westinghouse Co. was accepted for the lighting apparatus for the streets of Prince Albert. The outfit consists of fifty arc lamps, cut outs, regulating transformers, arresters and other supplies. The contract figure was $3,154.60. Fifty 12-foot mast arms will also be purchased from the Canadian General Electric Co. at $6.80.

The town council of Smith's Falls has leased what is known as the Foster grist mill and water power plant for ten years at $1,000 per annum, with the option of purchasing within two years for $18,000. The water commissions will use the power in connection with the water pumps, and thus save considerable in the purchase of coal.

Red Deer, Alta., authorities have made an offer to the Western General Electric Company for the town taking over the electric light and telephone plant, in view of the pending arbitration as to rates. The offer is practically the actual cash value of the plant, the figure to be determined by two arbitrators, one for each party, and in the event of their not agreeing, a third to be appointed.

The Ontario Power Company, Welland, is arranging to add two units to its present plant of six units, and the contract for the extension of the power house has been let to D. H. Simms. The extension will be one hundred feet long, and work will go on night and day to have it completed by December 1st. This will add 25,000 horsepower, making a total of [illegible] which the Ontario Power Company will have for use.

Tenders will be taken in the near future by the Hydro-Electric Power Commission for transforming stations. It is stated that specifications are about completed. The stations will be twelve in number, and will be built at the following points: Niagara Falls, Dundas (combined transformer and interswitching), Toronto, Brantford, Woodstock, London, Guelph, Preston (supplying Galt and Hespeler), Berlin (supplying Waterloo and New Hamburg), Stratford, St Mary's and St. Thomas. Stratford and St Mary's will depend upon the passage of the Stratford by-laws.

The Great Falls Power Company are endeavoring to interest the Manitoba Government in a proposition to purchase from thirty to a hundred thousand horsepower of electrical energy to be distributed throughout the province over the trunk lines of the government telephone system. The price would be fixed at $12 per horsepower, under a forty year contract. The company would not become a competitor of the government under the rate of twenty dollars. The company urges that electrical energy at such a cheap rate could be used for agricultural purposes, and even for cooking and heating.

Saw and Planing Mill News.

W. G. Gorvett's planing mill at Arthur, Ont., was burned.

The Cooke Lumber Company, will erect a saw mill at Nelson, B.C.

J. A. Roy & Fils' sawmill at St. Cyrille de Wendover, Que., was burned.

Davy Bros. Company's saw mill at Bancroft, Ont., was destroyed by fire.

Carew's sawmill, Lindsay, recently burned, reopened for operation on Sept. 1.

Davy's sawmill at Bancroft, Ont., was wiped out by fire together with a million feet of lumber.

The saw mill of the Lake Superior Corporation, at the Soo, was burned, entailing a loss of $100,000.

Sam. Richardson, Underwood, Ont., has bought the saw mill at Tiverton, and will begin operations in October.

The sawmill of R. Cunningham & Sons, at Port Essington, B.C., has been destroyed by fire, with loss of $25,000.

A sawmill of 50,000 feet capacity per day is to be built by Seattle and Vancouver capitalists at Skeena City, B.C.

Property has been purchased between Aylmer and Hull, Que., for the erection of a large saw-mill, to cost between $150,000 and $200,000.

C. O. Opdahl has purchased the old Thomson-Emery planing mill at Fort Frances, and will erect a new mill and wood-working factory.

The Dashwood planing mill at Goderich, was burned to the ground on Sept. 13. As the mill was uninsured, the company's loss is very heavy being about $30,000.

The McBurney Lumber Co., Campbellford, Ont., have started operations there. They are working day and night, and expect to saw 1,000,000 feet of lumber this year.

Damage to the extent of $10,000 was done at a fire which broke out last month at the lumber camp of Isaac Allan, at Mississippi, sixty miles north of Kingston.

The entire sawmill, including all the machinery, belonging to Dunn & Young, Young's Point, near Peterboro, was completely destroyed by fire. The owners will likely rebuild.

The Sinclair Lumber Company, one of the heavy operators on the Miramichi, will, it is reported, not lumber at all next winter. The lumber market being said to be very dull.

The Woods-Spicer shingle mill at False Creek has been burned. The loss is $35,000. This is the second time the company's mill has been burned in a year and a half. The company will rebuild at once.

The Watson Lumber and Trading Company, Watson, Sask., have sold their lumber yard and six lots with buildings thereon to T. A. Burrows & Co., of Grandview, Man. The price is close to $10,000.

The Mundy Lumber Company, Revelstoke, B.C., have shut down their mill at Three Valleys, as they are heavily stocked with lumber and figure they have enough to meet the demands of even a busy fall.

Negotiations are pending for the purchase of ten acres of land near Liverpool, B.C., by Chicago capitalists, their intention being to erect a large saw mill similar to the one at Hillside, which will employ some hundreds of men.

The Malcolm Lumber Company is a new Fairview, B.C. institution. The company is capitalized and otherwise equipped for the carrying on of a lumber manufacturing business. They have taken over the business of the Telford Lumber Company, and are installing on Sixth Ave. a modern mill of 50,000 feet daily capacity, which they expect to have running in a short time.

The big sawmill plant of the Canadian Pacific Lumber Company, at Port Moody, B.C., after shutdown of nearly five months, owing to the dullness in the lumber industry, has resumed operations. The company has just closed a contract to deliver 1,500,000 feet of clear lumber to be utilized in making the staves for the wooden pipe waterworks system to be installed at Calgary.

Tie making is giving work to a large number in Northern British Columbia, where the construction of the Grand Trunk Pacific is going on. The British Columbia Tie & Timber Company, at Seal Harbor, has already many thousands cut and piled: Richardson & Morrison have taken a contract to cut 100,000, and are getting them on the Copper River, employing thirty men, and Wilfrid Loiselle has cut 11,000 at Kitsumkalum River and has also 14,000 near Hole-in-the-Wall.

Railroad News.

Edmonton's street railway system is expected to be in operation in November.

The G.T.R. is relaying 47 miles of the Buffalo-Goderich branch with new rails.

The Ontario West Shore Electric Railway proposes extending the line to Stratford.

Another 100-mile section of the G.T.P. road in the Rocky Mountains has been contracted for.

The Canadian Northern has commenced construction work on the Oak Point line in Manitoba.

C. P. S. Morgan states that the new Brockville and Ottawa Railway will be commenced this fall.

The C.N.R. have decided to construct the 550 mile gap in the system between Sudbury and Port Arthur. Surveyors are now going over the ground.

Edmonton will construct and operate a street railway line at an estimated cost of $108,000 to $125,000.

Work has been begun again on the construction of the Canadian Northern Railway at Green's Creek, Ont.

Mackenzie & Mann will begin work in a few weeks on their line from North Battleford to Athabasca Landing and the coast.

The Drummond Company are now building a branch railway from the I.C.R. to their mines on the Nepisiquit, near Bathurst, N.B.

Work has been commenced by the Strathcona Radial Tramway Company on the grading of their line which has already been surveyed.

The I.C.R. is considering the building of a new station house at Chatham, N.B., and also the laying of a new line and additional shipping facilities.

A proposition is being discussed at Eburne, B.C., for the construction of an electric tram-line for the municipality of Point Grey, at an estimated cost of $200,000.

J. W. Moyes, president of the Ontario & West Shore Railway, has the contract for the construction of the line from Sarnia along the shore of Lake Huron to Owen Sound.

Arrangements have been completed for the extension of the B.C. Electric Railway's lines up the Capilano Valley to the second canyon. The line is to be in operation by next spring.

John Patterson, of the Dominion Power & Transmission Company, Hamilton, has gone to England to try and float the bonds for the proposed Waterloo and Guelph Railway.

A force of about 3,550 men is at present employed by Foley, Welch & Stewart on the G.T.P. grade west of Edmonton, a large proportion of these being between that city and the Pembina River.

The National Transcontinental Railway Commission has awarded to O'Brien & McDougall, the contract for the construction of 150 miles of road between Lake Superior Junction and Nepigon.

The C.P.R. terminal facilities at Fort William will be increased by the addition of new working house to elevator D. The contract calls for a working house capable of handling 400 cars every twenty hours.

A public meeting is to be called shortly to discuss the question of building an electric line from Belleville down to the two big cement plants. Unless this is done, the city merchants say they will lose about $50,000 a year in trade.

President McKenzie and General Manager McLeod of the C.N.R. state that grading on the road through the Shellbrook district, near Prince Albert, would be started this fall, and that the bridge across the river would be completed for business next spring.

The Standard Construction Company has been organized to construct further extensions of the Windsor, Essex & Lake Shore Electric Railway, and it is expected that as soon as the money market eases up, the extension from Leamington to Tilbury will be commenced.

The work of connecting the Niagara, St. Catharines and Toronto line with the T., H. and B. Railway at Welland, will be gone on with as soon as the government approves of the plan for the bridge, which it now has in its possession. The cost will be about $25,000.

The contract for the new branch line of the Canadian Northern, known as the Rapid City extension, sixty miles in length, from Holboro to a point forty miles west of Rapid City, has been awarded to the Northern Construction Co. Work will be proceeded with at once.

Thomas Malcolm, the contractor, who is building the International Railway, in New Brunswick, said he expected the road would be completed this fall. Good progress has been made since the recent strike. Supply trains are now being run along the completed sections, and considerable freight and passengers are carried. Lumbermen are finding the road a great convenience.

It has been officially announced that the C.P.R., the C.N.R. and the G.T.P. Railways have purchased 230 acres of land across the river in St. Boniface, and that a [illegible] plant will be erected. Representatives of large packing interests in Chicago have been in Winnipeg for the past week and it is now an assured fact that immense abattoirs and stock yards will be gone ahead with.

It is stated that a Canadian syndicate, headed by E. Hoffman, New York City, purposes building a railway from the American boundary to the southeast of Cardston, Alta., to Dawson City. The company which will be known as the Northern Empire Railway Company, are seeking permission to bond the railway to the extent of $30,000 per mile. It is expected that preliminary surveys will be started at once.

Two survey parties have left Prince Albert for the north on the Hudson's Bay Company's steamer. They are under the direction of J. Armstrong, and are going on the Hudson Bay Railway survey. The steamer went down the Saskatchewan River and one party of engineers will stop off at Pas Mission, while the other will proceed to Moose Lake. Two more parties are expected to survey about one hundred and fifty miles, thus dividing the six hundred miles to be covered into equal sections.

The Lindsay Construction Company, which has the contract of putting in the branch line of railway from Grand Lake to No. 12 Colliery, in Cape Breton, have about finished the work, the rails are being laid to the pit mouth. It is expected that the company will be shipping coal from the new mine next week. Material is being rushed in for the erection of the other bank head, and machinery and the other necessary accessories to a mine are fast being put into shape.

The much-talked of new Union Stock Yards, at Winnipeg, are coming at last. The land, about 100 acres in extent, has been secured, though the exact location has not yet been ascertained. It is known definitely, however, that it lies between the tracks of the three railways over in St. Boniface, and is excellently situated for the purpose. The purchase of the land has been guarded very carefully, but the three railways, C.P.R., C.N.R. and G.T.P., the big abattoir firms and a few others are interested in it.

The Grand Trunk Pacific has taken steps to cancel the contract with the Reynolds Construction Company for the building of 150 miles of the Abitibi section of the National Transcontinental. The G.T.P. sublet this section to the Reynolds Company, but that concern has failed to make satisfactory progress. The N.T. Commission has notified the railway company that unless 3,500 men were put to work on the section, the contract would be taken off their hands, and the railway would lose the $200,000 guarantee.

The fifth of the ten double tubes necessary to finish the under-the-river portion of the Michigan Central ten million-dollar tunnel between Detroit and Windsor, was successfully placed in position in the bed of the river. The river proper portion of the tunnel is now half down. It is expected that at least two more tubes will be put down before the running ice or cold weather compels suspension of work on this section of the tunnel. The sub-marine section is 2,600 feet in length. The open cut and approaches to the river section on both sides of the river, measures about 13,000 feet, making the total length approximately two and a half miles. Unless unforeseen obstacles, arise, the contractors expect to complete their work by June, 1909.

General Manufacturing News.

The Montreal Waterproof Co. suffered a loss of $35,000 by fire recently.

Mining operations have commenced at Loon Lake, Port Arthur district.

Douglas, Piper & Johnson, flax millers, will establish a flax mill at Saskatoon.

Fire destroyed the buildings of the Standard Printing Co., Havelock, Ont.; loss $41,000.

The steam laundry of J. H. Heighington, Wetaskiwin, Alta., was burned; loss $5,000.

The B.C. Copper Co.'s smelter at Phoenix, B.C., is treating 14,000 tons of ore a week.

A joint stock company is being formed to start a furniture factory in Richmond, Que.

The plant of the Canadian Packing Company, Pottersburg, Ont., was burned; loss $150,000.

The Peterborough Furniture Co. are considering the erection of a new building in Ashburnham.

The Kerr Milling Co.'s mill recently burned at Dundas, is being repaired and improved extensively.

The Barrie Shoe Manufacturing Company, has leased a block at Barrie and will extend its plant.

T. H. Everson, Oshawa, is contemplating removing his wire fence manufacturing plant to Vancouver.

E. J. Larter will erect a small factory at Toronto for the purpose of establishing a white goods business.

The Arnold Spring and Hinge Co., employing 100 hands, are asking for inducements to locate at Weston, Ont.

The Standard Sanitary Manufacturing Company, Pittsburg, will establish a Canadian branch in Toronto.

Reissner Bros., Leamington, have started a steel range factory in the Steel Goods Co. building at that place.

The Collier-Cunningham Co. and the Diamond Caulk Horseshoe Co., Peterboro, opened their new factory on September 1.

The Reversible Window Company, Detroit, proposes locating a branch in Canada, and is asking London for inducements.

TheYmir Mining Company is to spend $30,000 in development work and improvements about the Premier mine of Ymir district.

The Berlin Aluminum Co. has been purchased by the Hahn Brass Co., New Hamburg, and the plant will be removed to that place.

A big find of copper has been made at the McGowan mine, near Parry Sound, and it is likely a smelter will be built at that place.

A. B. Bettes, of Vancouver, is establishing a brick-making plant at McNab Creek, Howe Sound, where he has found some good clay.

The Peterborough Show Case Co. have secured factory premises in that city, and in addition to show cases will build door fixtures and cabinet ware.

Fire broke out in the boiler room of the condensing factory, used by Sweet Milk Condensing Co., Laurentide, Que., and did $15,000 damage.

Following the success that attended the recent building of a steel ship at New Glasgow, N.S., it is now likely that a steel steamer will be constructed.

The Stratford Manufacturing Company intends enlarging its factory immediately. A large painting department will be built and the staff increased.

A new branch of work has been taken up by the Preston, Ont., Coach & Carriage Co., which will manufacture carriages of the heavier class, as well as sleighs.

The J. H. Hanson-Tilley Co., Montreal, will take over the manufacturing business of Joseph H. Hanson, and will manufacture refrigerators, screen doors, windows, etc.

A company which proposes to establish department stores in the Maritime Provinces, also proposes to erect a factory for making wearing apparel, at Dartmouth, N.S.

A company controlling an invention for converting ordinary felt into a tough material, purposes establishing a plant in Keewatin, to manufacture canoes, boats, valises, etc.

It is reported that a wealthy syndicate of Belgians has purchased 10,000 acres at the head of Pitt Lake, B.C. After the land is reclaimed it is the intention to erect a big flax mill.

The Swedish-American Telephone Supplies Co., Chicago, intend establishing a Canadian branch under the name of the Dominion Telephone Supplies Co., and is looking at London for a location.

Pembroke Town Council have passed a by-law to give the Garry Brooks Company a fixed assessment for a number of years and to raise $1,000 to purchase a building site for the company.

A new concern recently established in Berlin is the Cloisonne Glass Co. It succeeds the Berlin Art Glass Co. This concern will do business under patents held by the Cloisonne Glass Co., London, Eng.

The first carload of pulp over the Halifax & Southwestern Railway, manufactured by the Harmony Pulp & Paper Company, arrived in Halifax. The pulp is said to be equal to the best manufactured in Canada.

Some rich-looking copper quartz has been discovered on the farm of James Johnston, near Packenham, Ont. Samples of it have been assayed and showed $79.95 worth of copper to the ton, and small quantities of gold.

The Car & Coach Co., Galt, have added a new line to their manufactures, the making of sleighs. They now manufacture cars and coaches, wagons, hacks, sleighs, cutters, and numerous other articles. In all probability they will soon be manufacturing automobiles.

The smelting works owned by the Deseronto Iron Company, were struck by lightning on September 1 and totally destroyed. The fire broke out in the charcoal shed. The iron works, which had been closed down for five months past, were being fitted out to start very soon.

Fire destroyed the dry house of the Anderson furniture factory, Newcastle, Ont. The whole building, with rotary mill, out buildings, stock, and about half the lumber in the yard went up in smoke. The loss is over $100,000. Insurance unknown. Fifty men are out of employment.

A new factory proposition has been received by Ald. Simpson, chairman of the Railways and Manufactures Committee. It is for the establishment of a big concern on the old rolling mills property, for the manufacture of frame work, sash doors, and other building material. The representatives are in the city, and are very favorably impressed with the site, and the railway switches already in position.

Newcastle was visited by fire and A. C. Allan's carriage factory was destroyed, the loss being over $1,000, with no insurance. The following day the Anderson furniture factory was burned down, the loss being over $100,000, with insurance about half that amount. The whole plant, with rotary mill, out buildings, stock of four carloads of furniture ready for export, and about half the lumber in the yard went up in smoke.

As a result of a visit of Dr. R. W. Ellis, of Ottawa, to Scotland, a new industry may be started to extract oil from the shale in Baltimore, Albert Co., N.B. Dr. Ellis has had 45 tons of this shale submitted to distillation as the Lesmaghon shale is treated. This process extracts oil and several valuable by-products. It pays in Scotland. Dr. Ellis thinks that the Albert shale compares most favorably with the Scotch article.

The Aspinwall Manufacturing Co., are soon to locate on the site now occupied by the Louden Machinery Co., Guelph. The Louden Co. factory on Crimea street is now under way, and as soon as they vacate their present premises the Aspinwall will commence work. The company manufacture potato machines, and have already worked up a good trade in this and other sections. For the present, it is not the intention to make all the parts of the machines, but to have the molding done by other firms in the city.

With the expansion of British Columbia, Cammel, Laird & Co., steel manufacturers, shipbuilders, engineers, etc., of the Old Country, have put in a stock at Vancouver, the representative being Nicol Thompson, who was formerly in the foundry and engineering business. This is one of the five places in the world where the company will carry stock and will cater to anything in the way of steel construction or engineering. Mr. Thompson has also interested Old Country capital in a deposit of magnesite, located in Atlin. This is used in the manufacture of refractory bricks, etc., and cement. In Atlin it is found in the purest form, being just like flour, and it is very probable that a manufactory will be established on this coast. The tests made have been thoroughly satisfactory.

Waterworks and Sewerage News.

Lindsay is beginning work on its filtration plant.

The trunk sewer at Preston, Ont., has been completed.

Improvements to Hull's waterworks system are said to be necessary.

Ottawa's new waterworks pumps were given a satisfactory test recently.

Sewer and waterworks extensions will be commenced shortly at Port Arthur.

Work on Fort William's sewerage system extension has been commenced.

Elmira, Ont., will spend $25,000 on extensions to their waterworks system.

North Vancouver's water mains are to be wooden pipe, 19,000 feet long.

Dartmouth, N.S., will spend about $59,700 on extensions to its water and sewage systems.

Calgary ratepayers have passed a by-law authorizing the extension of the sewerage system.

The trunk sewer and sewage disposal plant at Waterloo are now completed, the cost was $26,993.08.

New Westminster ratepayers have passed a by-law to raise $32,500 for waterworks extensions.

It is probable that a water system will be installed at Melbourne, Que., in the immediate future.

Oak Bay (Victoria, B.C.) property owners are petitioning for sewers on three streets in that town.

The City Gas and Electric Department is doing extensive construction work on its mains at Sherbrooke.

The citizens of Hamilton will vote on a bylaw to spend $90,000 for extending the waterworks system.

The Chilliwack, B.C., Township Council have been empowered to borrow $17,000 for drainage construction.

The Halifax City Council will borrow $35,000 to carry out improvements to sewers and permanent walks.

Extensions to the water and sewer services at Irishtown Crossing, Moncton, N.B., will soon be undertaken.

The Town Council of Orillia has decided to submit a $10,000 by-law to the people for waterworks purposes.

Brantford water cammissioners have decided to make extensive repairs and changes at the pumping station.

The contract for 4,200 feet of cast iron water pipe for Oak Bay, B.C., has been awarded to W. G. Winterburn.

The North Vancouver Council are considering a by-law to borrow $30,000 for the Lynn Valley Waterworks district.

The Goat Mountain Waterworks Company has been formed to provide a waterworks system for Creston, a town in the Kootenay.

Extensions will be made to Vancouver's waterworks system on Seventh Avenue, Thirteenth Avenue, Venables St. and Alder St.

A complete sewage system and sewage disposal works will be installed by the town of Vernon, B.C., at an estimated cost of $57,500.

Carman, Man., ratepayers will soon be asked to vote on a by-law for $25,000 for repairing and completing the sewer and waterworks systems.

The sanitary sewerage system being constructed at Brantford, is nearing completion. When finished, work on the storm sewers will be commenced.

The Northern Pipe Line Co. has been incorporated with a capital of $100,000. This is the line which is to supply Wallaceburg with natural gas.

A quarter million dollar pumping plant to supply Edmonton and Strathcona with water is the suggestion of Edmonton's waterworks superintendent.

The contract for the construction of a trunk sewer on Jasper Avenue, Edmonton, has been awarded to Westaway & Manders, at contract price of $21,351.

A by-law has been passed by Lethbridge ratepayers authorizing the erection of a second standpipe, and the installation of a new force main and septic tank.

A by-law submitted to the ratepayers of Red Deer, Alta., to extend the waterworks system on Gaetz Avenue and on Victoria Avenue at a cost of $4,500, was carried.

Wm. Mitchell, Niagara Falls, has been awarded the contract for the construction of the septic tank at the disposal works on Packham's Flats, Brampton, at $4,595.

Tenders for water mains at Moncton, N.B., were awarded to D. T. LaBlanc at a cost of $481.76. The Sumner Co.'s tender for pipe at $34.40 per ton was accepted.

The ratepayers of Strassburg, Sask., will vote on a by-law to raise $6,000 for the purpose of providing the town with proper fire protection, and provide a drainage system.

The Ottawa City Council has approved of extensions to the water mains in Ottawa east, to the property of the Ottawa Lumber Co., and extensions also in Hintonburg.

The work of laying the water mains in Palmerston will soon be completed, and the other work in connection with the installation of the waterworks system is being pushed.

Cobalt Town Council and the Township Council have come to terms regarding the proposed waterworks and sewerage systems for the town, and the work will now be proceeded with.

A sedimentation basin, in connection with the Saskatoon waterworks, will be constructed and tenders will soon be called for the work. A new engine and generator will be added to the plant.

The Concrete Engineering & Construction Co., Toronto, have been awarded the contract for laying the sewers at Preston and the Canadian General Electric the contract for the pumping apparatus.

The Ottawa Board of Control has decided to apply at once to the Railway and Municipal Board of Ontario for authority to begin work on the new aqueduct. What is proposed to be done at this juncture will cost $52,000.

A largely attended public meeting at London passed a resolution unanimously favoring immediate submission of the by-law authorizing the installation of a high-pressure water system at the forks of the river, to cost $200,000.

Tenders will be called for the construction of a pumping well and the making of connections between the conduit and pumping mains at Point St. Charles, in connection with Montreal's waterworks system. The cost will be about $25,000.

The Chatham water commissioners at their last meeting discussed the project of extending the water mains to every part of the city. The completion of the mains will, it is estimated, cost $10,000. The matter will be brought before the city council.

A successful test was made of Ottawa's new waterworks pumps recently. The contract for the pumps was awarded last winter to the Chaudiere Foundry & Machine Co., which sub

let it to Glenfield Kennedy & Co., of Kilmarnock, Scotland. The price being $30,500.

Steps are being taken by Ottawa to acquire the land needed for septic tanks and bacteria beds for the Ottawa South drainage system. Work will not commence till the Provincial Board of Health sanctions the plan, but the City Engineer is advised that this will be done some time in September.

The Prince Albert waterworks extension contract for the year is nearing completion. The pipes have been laid, and the hydrants put in place. This year's work, when finished, will give a greatly increased area of water service and fire protection. Prince Albert now claims to be one of the best fire-protected towns in Western Canada.

The Dartmouth (N.S.) Town Council has decided to purchase the following supplies for water and sewer extension: 2,000 feet of lead lined iron pipe for house connections; 25 barrels of cement; 10 fire hydrants; 13 gate valves; 4 dozen corporation cocks; 2 dozen of machine cocks, and 4 dozen of nipples. Tenders are advertised for the above.

The Dunnville, Ont., people interested in the gas fields at Selkirk have all sold out to the Producers Gas Co., Hamilton. The Erie Gas Co., which had 12 wells, received $44,000. Lalor & McCutcheon, who sold a portion of their interest to the Producers Co. some time ago, have disposed of the remainder, receiving in all $37,000. They had 27 wells.

Both Ridgetown and Blenheim are due to receive natural gas in very short order. Superintendent Dowd, of the Volcanic Oil & Gas Co., having purchased the necessary pipe for the lines to these towns from the Tilbury and Romney fields. Both places will have gas by Dec. 1, and gasfitters may look forward to a busy season.

Montreal's famous 12,000,000 gallon Worthington pump, which was to revolutionize the city water supply, has broken down. It took about three years to build, and cost the city a great deal of money. The delivery pipe has burst. In addition to this, one of the valves which let water from the aqueduct into the pumping station proper has become wedged and cannot be opened.

The tender of the Minneapolis Steel & Machinery Co. was accepted for the new waterworks stand-pipe at Lethbridge, at a cost of $13,365. The Canadian Iron Foundry Company received the contract for supplying the 12-inch cast iron pipe for the force main, at $45.80 per ton. The contract for hydrants, valves, etc., was divided between the Kerr Engine Co. and the Canadian-Fairbanks Co., the total cost being in the neighborhood of $2,600.

Superintendent Madison, Vancouver, has reported to the Civic Water Committee that the water mains in certain parts of the city are beginning to show the effects of electrolysis, through the leaking of the current from the rails of the tramline. A similar condition of affairs had prevailed two years ago, but the British Columbia Electric Railway Company had bonded its rails to the mains at many points, which had abated the trouble. In the last two months, however, it has again appeared.

The Calgary City Council has accepted the tender of John Gunn & Son, Winnipeg, for work on a gravity waterworks system, one of the greatest improvements ever attempted in the city. The tender was $156,195, which includes work on the pipe line and excavations, complete from intake to reservoir, a distance of over 10½ miles. The lowest tender was that of F. F. Fry, of Moose Jaw, at $153,360. The next highest was that of the Redwood Manufacturing Co., of San Francisco, at $172,000. The cost estimated by Consulting Engineer Mitchell was $204,080.

The British Canadian Wood Pulp Company, which has a process for the manufacture of wood pulp from any kind of wood refuse, is making a bid for the gas franchise of North Vancouver. It has a demonstrating plant in this city to show how gas is made as a by-product in the manufacture of pulp at very little expense. This company is erecting a pulp mill at Port Mellon, Howe Sound, a few miles from Vancouver, and the pulp will be first manufactured at North Vancouver, if plans materialize, and then taken to Port Melton to be manufactured into paper.

Structural Steel Construction News.

A new bridge over the Boyne two miles east of Carman, Man. has been completed.

Frank Roberts, Dundas, has the contract for the erection of the McMurray steel bridge at that place.

Work has at last commenced upon the new Eramosa bridge, at Guelph, by the Western Bridge Company.

Sinclair & Smith, New Liskeard, Ont., have been awarded the contract for the construction of a bridge across the Blanche river, at about $5,000.

R. N. McLean, superintendent, states that the new steel bridge six miles east of Gladstone, known as the Carruthers' bridge is ready for traffic.

The Dickson Bridge Works Co., Campbellford, has secured the contracts for erecting the superstructure of two bridges in Peterboro County, North River and Norwood bridges.

Tenders will be received by E. Abbot Johnson, County Clerk, of L'Original, Ont., until October 6, for the construction of an iron highway bridge over the Big Castor River.

The contract for the construction of the substructure of the G.T.P. bridge across the Pembina River, near Edmonton, Alta., has been awarded to John Gunn & Sons, Winnipeg.

In connection with the new county roads system, adopted by Waterloo County Council, the first contract has just been awarded to Eichler & Huehn for a new steel and concrete bridge at Maysville, Ont.

The trouble in the Brandon City Council as to whether the bridge over Assiniboine River shall be of concrete or steel, was advanced another step, when by the casting vote of the mayor, it was decided to change from concrete to steel.

Messrs. McNeil were notified that they were the successful tenderers for about one thousand tons of bridge work, viz.:One 50-foot span over the Segas River; one span over Green River; one over Grand River; one over Laker River, and one over Four-Mile Brook. The latter is a thirteen-deck girder, spans carried on six towers, which are sixty feet high.

Trade Notes.

The Vulcan Iron Works, New Westminster, will instal a fruit-curing plant in connection with the Chilliwack fruit cannery.

The Watson-Stillman Co., New York, manufacturers of hydraulic jacks, presses, etc., have appointed Alfred Collyer & Co., Montreal, Canadian agents.

The Marconi Wireless Telegraph Co. have recently placed an order with the Robb Eng. Co. for a 75 h.p. Robb-Armstrong engine for their Glace Bay station.

The tenders for the new man-hole castings were awarded by the Board of Control to the Vulcan Iron Works and Peterson Brothers' Iron Works, both of Winnipeg.

The last contract in connection with the Edmonton street car system was let by the awarding of the motors to the Canadian General Electric Co., Peterboro.

John F. Allen, 370-372 Gerard Ave,m New York, builder of portable pneumatic riveting machines, reports a recent sale through their Paris agents, Fenwick Freres & Co. of one "Allen" jaw riveter, 25 inches reach, 4½ inches gap, 10 inches cyl., to Stussi & Zweifel, Milan, Italy.

The Smart-Turner Machine Co. have received orders for their pumps:—Northumberland Paper & Electric Co., Campbellford, Ont.: Fred Armstrong Co., Toronto; Electric Metals, Limited, Welland, Ont.; Reid Foundry Co., Ingersoll; T. & N. O. Ry., North Bay; Thos. A. Ives & Sons, Port Dover, Ont.; and C.P.R. for their boats on Kootenay Lake.

The Birmingham Iron Works were awarded the contract for machinery to equip the first unit of the new rubber mills which S. H. C. Miner is building at Granby, Que. The order amounts to about $50,000 and the machinery is to be delivered as fast as the buildings are ready to receive it. Mr. Miner is now treating with experts for the installation of the electrical equipment for the new works.

Evidences of Industrial Revival.

The Belleville Brass Works were the recipents recently of an order for 14,000 hinges. Although a new concern they now have 35 men employed.

Mawhinney Bros.' shingle mill, at Eburne, B.C., has resumed operations. The plant consists of two Simplex shingle machines with a capacity of about 50,000 shingles per day.

The butter dish and berry box factory at Rodney, Ont., is to be enlarged this fall, a quantity of new machinery being installed. The company intend operating all the year round.

The works of the Acton Tannery Co., Guelph, have been re-opened after a close-down of two weeks. They opened with a full complement of men, on an eight-hour scale, but the prospects are that they will go on full time shortly.

The E. R. Burns Saw Co., Toronto, report a most satisfactory showing for the first six months of the year. During this time the "limited" company, under new management and improved facilities, have so increased their trade that they are now waiting extensive additions to their factory and plant.

While conditions in the industrial world may not be entirely favorable at present, Brantford manufacturers are agreed that there is every prospect of improvement. Moreover, it is the opinion of nearly all that the better times will come in the immediate future. In a place like Brantford, which is essentially a manufacturing centre, prosperity is dependent on prevailing industrial conditions. In general, the situation is on the mend, and the anticipated good yield in the west this fall will aid materially, as Brantford's industries are so closely allied with western agriculture.

The situation in regard to mining in British Columbia is of the best. Every week news comes from the Kootenay of strikes on old properties. This shows that there is good value in the ground, but is more important as it indicates that steady work is being done, and this means a basis for general business. In connection with mining, Percy Williams, manager of the Boston Pioneer Development Co., will have a new and large dredge built for gold saving operations on the Fraser River, at Lillooet, showing that no part of the resources of the province is bein overlooked.

The woodworking mill of the Silliker Car Works, Halifax, is busily employed, keeping pace with orders which tax its capacity. "The entire plant at Sydney is going full blast," said F. P. Jones, general manager of the Dominion Steel Co., "and we expect that shipments this year will be the biggest in the history of the Dominion Steel Co. If the output does not break the record, it will be very close to our previous high water mark. Recent bookings were — per cent. greater than the output, and that, of course, is very satisfactory. I think I can safely say that business is gradually improving and that we have seen the worst."

The lumber industry in British Columbia is picking up slowly, and the flurry of business that has now come may make things good until the steady demand that is expected after the New Year. E. H. Heaps & Co., Vancouver, have received an order for thirty million shingles for eastern markets, and the W. F. Hunting Lumber Co. is closing an order for about five million. These are two good orders indicative of the general run of business. In Ladysmith, the Ladysmith Lumber Co. is very busy, particularly with local trade. Considerable building is going on there which will be good not only for the lumber and attendant industries, but also for the hardware stores.

Never in the history of the Nova Scotia Steel & Coal Company were the prospects for a prosperous year so bright as at the present time. The prediction made at the beginning of the season for a banner year in the output of coal has even now exceeded the most sanguine expectations. No doubt the securing of the contracts with the Elder-Dempster steamship line assisted in swelling the shipments of the company's output. At any rate, there is not a pound of coal banked by the company, and according to the outlook it will be some time before any quantity is piled up. An idea of the vast amount of coal raised may be gathered from the fact that for the past eight months no less than twenty-five thousand tons of coal have been taken from the different collieries of the Nova Scotia Steel & Coal Company, more than was raised for a similar period in 1907, and this, too, in view of the fact that last year was a record one for the company.

Building Notes.

Mr. Smith will build a large brush factory at Brantford.

The Stratford Mfg. Co., Stratford, will build an extension to its factory.

The Hagan Shirt & Collar Co., of Berlin, will erect a four-storey building.

A new laundry will be erected by the Fort William Laundry & Dye Works Co.

A new wood-working factory will be built by J & D. A. Harquail at Campbellton, N.B.

The Hall Company, Limited, Hanley, Sask., have decided to erect an elevator at Tugaske.

Daysland, Alta., will have a pump factory. The building will be erected by Wendt & Hancock.

The Meyers Milling Co., Listowel, are building a three-storey brick addition to their present building.

The Redpath Estate, Montreal, has taken out a permit for the erection of a five-storey warehouse to cost $22,000.

Clark & Adams have the contract for the warehouse on the dock at St. John, N.B. The contract price is $15,642.

Manchester-Robertson-Allison, owing to increased business, are forced to erect a new building at St. John, N.B.

The Manitoba Gypsum Co., Winnipeg, have been granted a permit for the building of a $3,000 addition to their mill.

The Kennedy & Davis Milling Co., Lindsay, is branching out, and is erecting a woodenware factory to employ 40 bands.

A permit has been issued for a two-storey warehouse to be erected for Fraser, Viger & Co., Montreal, at cost of $15,000.

The New York pulp mill, to be erected at Norman, Ont., will get exemption from taxes Work will commence on it at once.

The Waterworks Committee, Montreal, has awarded Montreal Ship Lining Co. the contract for the erection of a new workshop at [illegible].

The G.T.P. have secured right-of-way through the Township of Skeena, B.C., and a passenger station, freight shed and yards will be erected soon.

The American Cyanamide Co. is beginning construction work on its plant at Niagara Falls, Ont. Between 500 and 600 men will be employed when finished.

The proposed Ridgetown canning factory is apparently to materialize after all. The promoters have agreed to commence building operations October 1.

F. Neil Brodie has prepared estimates, amounting to $13,488, for the proposed improvements to the St. John, N.B., public schools in the way of better fire protection.

The Builders' Supply Co., St. Catharines, has the contract for building the new Whitman & Barnes factory at that place. The structure must be ready by October 10.

The work of constructing the large new plant for the Sydenham Glass Co., Wallaceburg, is now under way, Mr. Armstrong, of Pittsburg, Pa., superintending the construction work.

Architect A. W. Peene has awarded the contracts for the new office building to be erected for the Hamilton Steel & Iron Co. The building will cost about $14,000 and will be thoroughly up-to-date.

Western Explosives, Ltd., has given a contract for the building of a dynamite and powder plant near Vancouver to Geo. MacFarlane, at a cost of $80,000. Acid works to cost $250,000 will also be erected.

Milton is to have another large factory. The C. R. Wilmott Co. has purchased nine acres of land near the C.P.R. station, and about November will begin the erection of an $60,000 building, to employ about 100 hands in the manufacture of agricultural implements.

Construction of the water power plant at Fort Frances and International Falls will be gone on with as rapidly as possible. The dam will develop 30,000 h.p. When it is complete a paper and pulp plant with a capacity of 500 tons a day will be built by the Backus-Brooks syndicate.

Excavation has begun on the site of the new building to be erected by the Ottawa Paint Works. The building will be 48x104 feet and two storeys high. The location is on Wellington Street near Rochester. The firm has entirely recovered from the effects of the fire in the spring, and J. Young, the manager, says the number of orders on hand are far in excess of last year.

Companies Incorporated.

Canadian Brass Co., Galt; capital, $100,000; to manufacture brass goods. Provisional directors, E. J. Getty, F. S. Scott and H. Leadon, all of Galt.

The Ontario Brass Rolling Mills, Toronto; capital, $200,000; to manufacture and deal in metal and metallic compounds. Provisional directors, J. F. Brown, W. R. Travers and J. J. Walsh, all of Toronto.

The Electrical Fittings Co., Toronto; capital, $40,000; to manufacture and deal in electrical supplies and fittings. Provisional directors, A. C. B. Jones, A. C. McMaster, Lena Duff and Violet W. Jenner, all of Toronto.

The St. Clair Oil Co., Toronto: capital, $100,000; to deal in ores, metals, minerals and oils. Provisional directors, J. J. Grny, A. W. Briggs and Evelyn L. Fowler, all of Toronto.

The Ontario Silica Co., Windsor; capital, $100,000; to manufacture glassware. Provisional directors, A. Lawson, C. E. Green, H. Clay, G. J. Leggatt and A. B. Hobson, all of Windsor.

The Arbetter Felling Machine Co., Montreal; capital, $400,000; to manufacture felling, sewing and other machines. Provisional directors, P. Durocher, A. C. Calder, C. T. Jette, O. Gagnon and J. M. Montle, all of Montreal.

The Perrin Plow & Stove Co., Smith's Falls; capital, $200,000; to manufacture agricultural implements and stoves. Provisional directors, F. R. Oliver, Minnie A. Oliver, R. S. Harder, B. Knapp, R. J. Oliver, all of Smith's Falls.

The London and Western Counties Pipe Line Co., London; capital, $1,000,000; to develop natural gas and oil fields. Provisional directors, F. G. Rumball, W. Scarlett, W. J. Teasdall, T. E. Robson, H. W. Ansley and A. A. Campbell, all of London.

G.T.P. Winnipeg Shops.

Tenders are now being advertised for the construction of the new National Transcontinental locomotive shops on the site already selected six miles east of Winnipeg. They close October 8th. The total cost of construction and improvements of yards and shops will be $5,000,000, of which the Government contributes $1,500,000, and the G.T.P. $3,500,000.

Canadians Capitalize U.S. Industry.

It is learned on reliable authority that prominent London, Ont., capitalists and two Detroit iron men will build a new rolling mill at Toledo, Ohio, the work to commence before the end of the year. Recently representatives of the capitalists have been looking over desirable sites. The men returned to their homes to-day after procuring a site near Presque Isle. It is said that the capitalists have plenty of money behind them. The approximate cost of the mill will be $400,000.

New Whitman & Barnes Buildings.

Work on the new two-storey factory of Whitman & Barnes, St. Catharines, for the manufacture of bammers, wrenches, machine knives, etc., will be commenced at once. In addition to the factory a large warehouse will be erected to carry a complete stock of mower and harvester knives, sections, guard plates, twist drills, reamers, drop forged, "Bull Dog" and screw wrenches, bammers, etc. Both of these buildings will be of slow-burning mill construction, and the equipment will be the most up-to-date pattern.

Engineering at Y.M.C.A.

Classes have reopened at the Montreal Y. M. C. A. and class instruction, lecture and demonstration will be given in boiler firing; boiler, engine and machine design; mechanical drawing and mechanical engineering. Some new features which will be considered in detail are estimates, operating and construction costs, fuel saving, smoke prevention and kindred appliances for increasing efficiency and economy. The classes are held for firemen, engineers, mechanics draftsmen, etc., and Peter Bain, consulting mechanical engineer, has charge of this department of the association's work.

Imperial Locomotive Works.

Mr. H. A. Roy, M. Inst., C. E., general manager to Beyer, Peacock & Co., Manchester, Eng., has been appointed managing director of the Imperial Locomotive Works at Lachine, near Montreal. A portion of the plans has been approved and Mr. Roy is expected to arrive in Canada to sign the contracts so that the foundations for the enterprise, behind which there is unlimited capital, may be started at once The buildings were planned in England and changed to suit the ground, which has been purchased at Lachine by H. C. Stone, Montreal. The plans call for an expenditure of $2,250,000.

Elect New Manager.

At a meeting of the new directors of the Western Iron Works, Ltd., Winnipeg, held recently, David Trainer, formerly of the Carnegie Steel Company, the Canadian Copper Company, was elected manager vice H. R. Eade, who has taken the position of secretary-treasurer. The board together with the new management are instituting a vigorous and progressive policy, new capital being interested in the company. The directors are: C. A. Baskerville, president; C. P. Banning, vice-president; A. R. D. Patterson, second vice-president; C. M. Simpson, J. L. Doupe, Alex. Simmers, W. A. McLeod, H. H. Corbett and David Trainer.

B.C. Electric Ry. Improvement.

The contract was awarded recently by the British Columbia Electric Railway Company for the installation of a turbine water wheel at the Lake Buntzen generating plant, the capacity of the equipment being 11,000 h.p. The John McDougall Company, of Montreal, secured the contract, and the new wheel will be the Doble type, a class of turbine equipment.

The award of the contract forms part of the company's scheme for increasing the supply of power from the North Arm plant, the ultimate cost of this scheme along being $300,000. Involved in the plan is the extension of the stone building housing the hydraulic equipment for about 60 feet and the installation of generating machinery capable of turning out 10,000 horse-power of electrical energy. To run the equipment two additional pipe lines will be laid from the Lake Buntzen dam to the powerhouse.

Steel by Electricity.

At the plant of the American Electric Furnace Co., at Niagara Falls, Ont., a fine grade of tool steel is being made entirely by electric process. Experiments have been going on for some time, and they have been very successful In fact, Mr. Rowland, the manager, now has all the rough edges worn away and things are running very smoothly. Pig iron in bar is put in the furnace, and in about three hours is ready for drawing off. The time required, however, depends on the quality of the pig iron.

This electric process, is, of course, secret, and is designed to supplant the crucible process now generally in use. It produces good steel more cheaply. This company proposes to sell electric furnaces, and is not manufacturing steel on a commercial basis. The process was invented in Sweden, but the American Electric Furnace Co. has the sole right for Canada and the United States.

Helen Iron Mine Electrical Equipment.

The Lake Superior Power Co. has gone into an extensive scheme for the improvement of the Helen Iron Mine, in West Algoma. It will be of the most modern character, using electricity wherever feasible. A large part of the plant operated by steam will be adapted to motor drive.

The Algoma Power Co. will instal a hydro-electric plant on the Michipicoten river, where there is a fall of 128 feet to furnish the necessary power. The power unit will consist of a 1,000 h.p. single horizontal turbine water wheel, direct connected to a 600 k.w. direct current generator connected to a h.p. turbine. Transformers will reduce the current from 10,000 volts to 600 volts.

In the application of this power the mining company will use a 150 h.p. induction motor to drive one of its large mining hoists, a 60 h.p. induction motor to drive one of the smaller hoists, one 85 h.p. induction motor to drive its Gate "K" crusher, and a 15 h.p. motor of similar design in the machine shop. Compressed air for drilling will be supplied by a 16½x18 air compressor driven by a 200 h.p. induction motor. Water will be pumped by one 4-inch single-stage turbine driven by a 30 h.p. motor and another 2-inch two-stage turbine, driven by a 7½ h.p. motor.

The contracts for the entire electrical equipments for both these instalations, as well as for the air compressor and pumps have been awarded to Allis-Chalmers-Bullock, Limited, of Montreal, manufacturers of complete hydro-electric plants.

BOOK REVIEWS.

PRACTICAL PROSPECTIVE.—By F. Richards and F. H. Calvin. Published by Norman W. Henley Pub. Co., New York. Price 50c.

It shows how to make all kinds of mechanical drawings in practical prospective isometric. It makes it plain, so any mechanic can understand a drawing made in this way, and contains practical examples of various classes of work.

PROPER DISTRIBUTION OF EXPENSE BURDEN—By Hamilton Church. Published by the Engineering Magazine, 140-142 Nassau St., New York.

The correct distribution of the expense burden is of course one of the most important and most difficult problems in accurate cost-accounting. Mistakes of principle or of practice in this distribution have perhaps led to commercial disaster as often as any one error in commercial management. Mr. Church's mode of handling this question is thorough, sound, sensible and scientific; and while it is addressed particularly to the machine shop, it is applicable to any manufacturing plant.

The matter which appears in this book was originally published in a series of articles in the Engineering Magazine. In his work, the author has gone to the root ideas of cost finding, and lays down broad principles, by which safe and reliable figures may be obtained for machine, piece and job costs. He does not touch on such matters as the size, ruling or printing of forms and cards, matters which should be designed by the accountant to fulfill

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PRESSURE PUMP.—Leaflets from Burke Machinery Co., Cleveland, Ohio, describing a new pressure pump designed for pumping pressure for testing valves.

ROPE TRANSMISSION.—From Jones & Glassco, Montreal, a well illustrated and written treatise on Transmission of Power by Ropes and the system used by William Kenyon & Sons, Limited, Dukinfield, England.

GRINDING MACHINES.—Catalogue No. 2, from Dayton Machine & Tool Works, Dayton, Ohio, describing fully with numerous illustrations the features of their grinding machines for tool grinding and manufacturing.

WORM GEARS.—Catalogue No. 4, from Morse, Williams & Co., Philadelphia, Pa., containing 115 pages, illustrating and giving full dimensions of their Hindley worm gears, Hindley spiral gears, casings or housings for worm gears and straight worm gears.

CANADA'S GREAT EASTERN EXHIBITION.

Canada's Great Eastern Exhibition, the 24th annual fair of the Eastern Townships Agricultural Association, held at Sherbrooke, August 29 to September 3, was a decided success from every view point. Favorable weather increased the attendance to a record-breaking point and exhibits and entertainment features were easily the best in the history of the fair.

Retailers attending the fair were naturally interested in the exhibits in the main building, which was well filled with attractive displays. In this building the H. & E. Lifting Jack Co., Waterville, Que., had their showing, as the machinery hall at this fair has not developed to an appreciable extent.

H. & E. Lifting Jack Co., Waterville, Que., had, as the illustration gives some idea of, an interesting exhibit of their H. & E. Jacks in the main building. They show 15, 20, 25, 35 and 50-ton Patent Ball-Bearing Lifting Jacks in various styles, designed for railway, way Jacks, Carpenters' and Builders' Jacks, Traversing Base Jacks, and Ballway Jacks, carpenters' and builders' jacks, traversing base jacks, and Ball-Bearing Locomotive Journal Jacks for the heaviest equipment.

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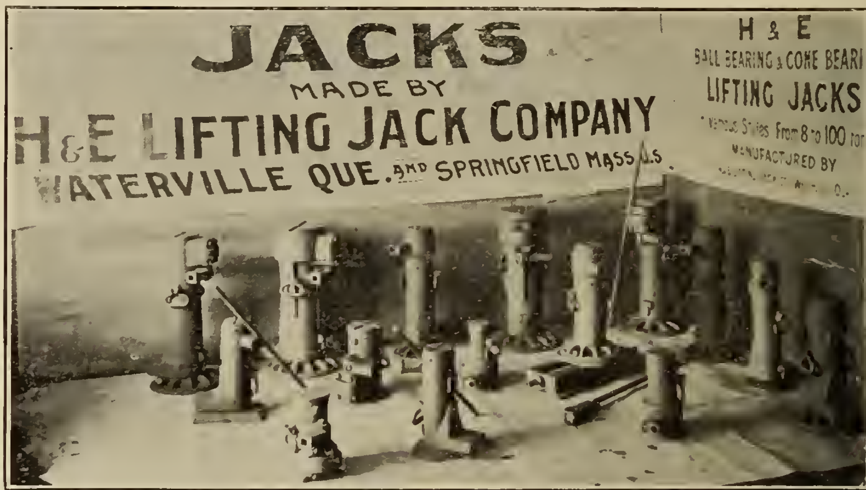

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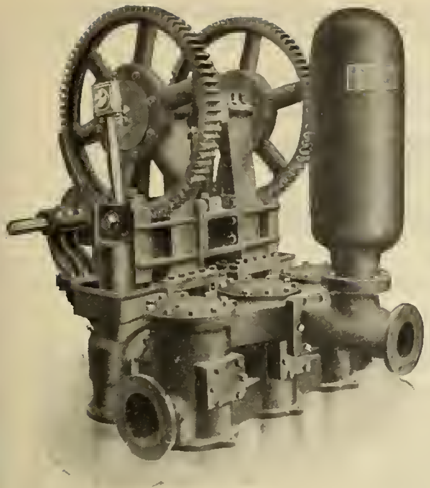
tionary turned standard, on which it revolves freely, allowing the lever socket to be brought into any position convenient for working. The standard, which is hollow, can be filled with oil, thus keeping the screw thoroughly lubricated.

The screw is made of crucible steel of large diameter, with the brace form of thread, and works in a phosphor bronze nut; to the upper end of the screw and bearing on the large steel ratchet or gear, are hardened and ground steel plates, with trains of hardened steel balls between them, the whole of which forms a ball-bearing end thrust between the screw and inside top of sleeve, reducing the friction and increasing the power of the jack. The jack is operated by the horizontal motion of the lever which, in the great majority of cases, is the most natural and convenient way of lifting. The lower end of the sleeve is provided with a pawl which enters a groove cut around the top end of standard to prevent the screw from being run out of the nut. By means of the sliding sleeve the jack is very much strengthened and working parts thoroughly protected from weather, sand or grit of any kind.

R. O. Hopkinson, manager of the firm and designer of the jacks, and R. L. Edgcombe, of the firm, who were capable and expert demonstrators at the exhibit, have an intimate, practical knowledge of the lifting jack business, Mr. Hopkinson having been a builder of jacks for a number of years before the present patents were taken out and the present business established. The Canadian business was started about a year ago, and they have 22 styles of jacks, ranging in capacity from 8 to 50 tons.



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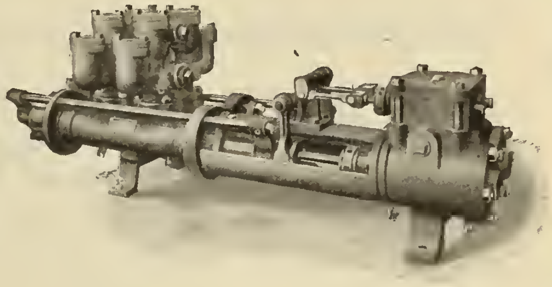

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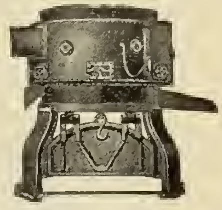

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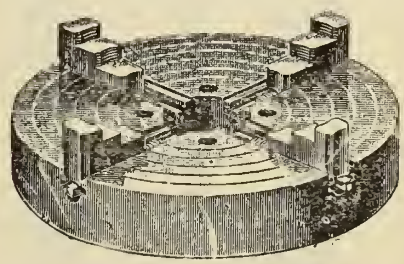

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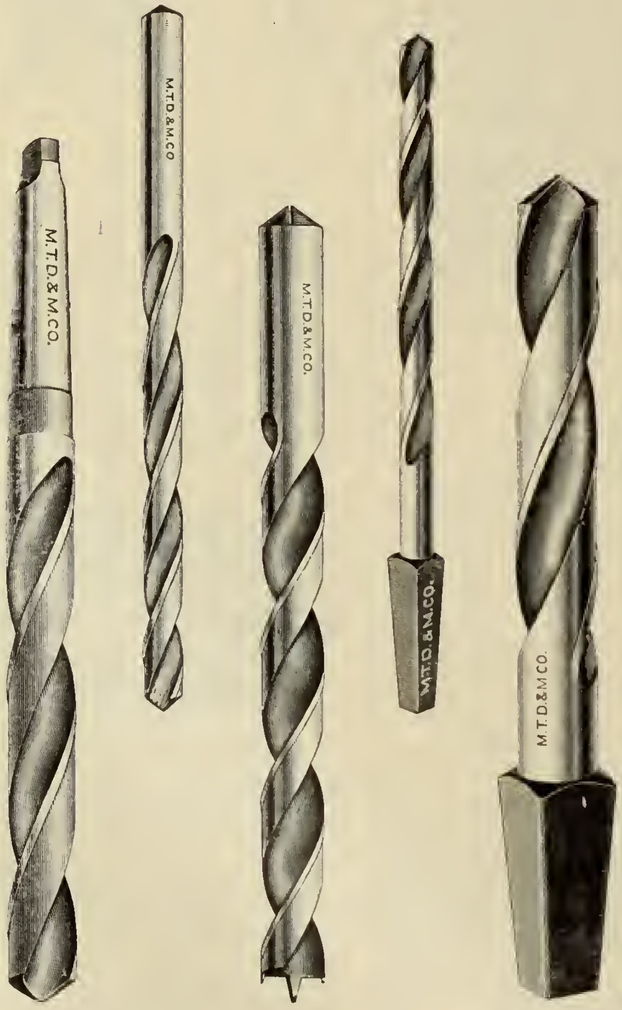

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Wilson, J. C., & Co., Glenora, Ont.

Castings, Phosphor Bronze.
Lumen Bearing Co., Toronto.

Castings, Semi-Steel.
Reid Foundry & Mach. Co., Ingersoll.
Robb Engineering Co., Amherst, N.S.

Cement Machinery.
Allis-Chalmers-Bullock, Limited, Montreal.
Gardner, Robt. & Son, Montreal.
Jeffrey Mfg. Co., Columbus, Ohio.
John McDougall Caledonian Iron Works, Co., Montreal.
Owen Sound Iron Works Co., Owen Sound.

Centreing Machines.
John Bertram & Sons Co., Dundas, Ont.
Gardner, Robt. & Son, Montreal.
Jeffrey Mfg. Co., Columbia, Ohio.
Lewis, Rice, & Son, Toronto.
London Mach. Tool Co., Hamilton, Ont.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Hartford, Conn.

Centrifugal Pumps.
John McDougall Caledonian Iron Works Co., Montreal.
Pratt & Whitney Co., Hartford, Conn.

Chain Blocks.
Schuchardt & Schutte, New York.

Charcoal.
Detroit Foundry Supply Co., Windsor.
Dominion Foundry Supply Co., Toronto.
Hamilton Facing Mill Co., Hamilton.
Hyde, Francis & Co., Montreal.
Smith, J. D., Foundry Supply Co., Cleveland, Ohio.
Stevens, F. B., Detroit, Mich.

Chemicals.
Canada Chemical Co., London.

Chrome Brick.
Harbison - Walker Refractories Co., Pittsburg.

Chucks, Drill and Lathe.
American Tool Works Co., Cincinnati.
John Bertram & Sons Co., Dundas, Ont.
Canada Machinery Agency, Montreal.
Cleveland Twist Drill Co., Cleveland.
Gardner, Robt. & Son, Montreal.
Hamilton Tool Co., Hamilton, Ont.
Jacobs Mfg. Co., Hartford, Conn.
Ker & Goodwin, Brantford.
London Mach. Tool Co., Hamilton.
Milroy-Harrison Co., Toronto.
National Twist Drill & Tool Co., Detroit.
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.
Rice Lewis & Son, Toronto.
Standard Tool Co., Cleveland.

Chucks (Planer or Milling.)
Gardner, Robt. & Son, Montreal.
Holland's Mfg. Co., Erie, Pa.

Chucking Machines.
American Tool Works Co., Cincinnati.
Lewis, Rice, & Son, Toronto.
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.
Warner & Swasey Co., Cleveland, Ohio.

Circuit Breakers.
Allis-Chalmers-Bullock, Limited, Montreal.
Canadian General Electric Co., Toronto.
Canadian Westinghouse Co., Hamilton.
Gas & Electric Power Co., Toronto.

Cloth and Wool Dryers.
B. Greening Wire Co., Hamilton.
Sheldons Limited, Galt.

Coal Boring Machines.
Cumming, J. W., New Glasgow, N.S.

Coal Handling Machinery.
Jeffrey Mfg. Co., Columbus, Ohio.

Coal Miners' Tools.
Cumming, J. W., New Glasgow, N.S.

Collars.
Dodge Mfg. Co., Toronto.

Collectors, Pneumatic.
Sheldons Limited, Galt.

Compressors, Air.
Allis-Chalmers-Bullock, Limited, Montreal.
Canada Foundry Co., Limited, Toronto.
Canada Machinery Agency, Montreal.
Canadian Rand Co., Montreal.
Canadian Westinghouse Co., Hamilton.
Darling Bros., Ltd., Montreal.
Hall Engineering Works, Montreal, Que.
H. W. Petrie, Toronto.
John McDougall, Caledonian Iron Works Co., Montreal.
Monarch Eng. & Mfg. Co., Baltimore, Md.
Niles-Bement-Pond Co., New York.
The Smart-Turner Mach. Co., Hamilton.
Williams & Wilson, Montreal.

Concentrating Plant.

Allis-Chalmers-Bullock, Montreal.
Gardner, Robt. & Son, Montreal.

Concrete Mixers.

Jeffrey Mfg. Co., Columbus, Ohio.

Condensers.

Canada Foundry Co., Limited, Toronto.
Canada Machinery Agency, Montreal.
Goldie & McCulloch Co., Galt.
Hall Engineering Works Montreal.
Smart-Turner Machine Co., Hamilton.
Waterous Engine Co., Brantford.

Consulting Engineers.

Connor, A. W., Toronto
Fensom, C. J., Toronto
Hall Engineering Works, Montreal.
Jules De Clercy, Montreal.
Roderick J. Parke, Toronto.
T. Pringle & Son, Montreal.
Somerville, T. A., Hamilton
Stewart & McTaggart, Hamilton
Taylor, James, New Glasgow, N.S.

Contractors' Plant.

Allis-Chalmers-Bullock, Montreal.
John McDougall, Caledonian Iron Works Co., Montreal.
Niagara Falls Machine & Foundry Co., Niagara Falls, Ont.

Controllers and Starters Electric Motor.

Allis-Chalmers-Bullock, Montreal.
Canadian General Electric Co., Toronto.
Canadian Westinghouse Co., Hamilton.
T. & H. Electric Co., Hamilton.

Conveyor Machinery.

Dodge Mfg Co., Toronto
Goldie & McCulloch Co., Galt
Jeffrey Mfg. Co., Columbus, Ohio.
Laurie Engine & Machine Co., Montreal.
Rice Lewis & Son, Toronto.
John McDougall Caledonian Iron Works Co., Montreal.
Smart-Turner Machine Co., Hamilton.
Waterous Engine Works Co., Brantford.
Williams & Wilson, Montreal.
Wilson, J. C., & Co., Glenora, Ont.

Coping Machines.

John Bertram & Sons Co., Dundas, Ont.
London Mach. Tool Co., Hamilton.
Niles-Bement-Pond Co., New York.

Corundum and Corundum Wheels.

Canadian Hart Wheels Ltd., Hamilton

Core Box Machines.

Fox Machine Co., Grand Rapids.

Core Cutting-off and Coning Machine.

Falls Rivet & Machine Co., Cuyahoga Falls, Ohio.

Core Compounds.

Buffalo Foundry Supply Co., Buffalo.
Detroit Foundry Supply Co., Windsor.
Dominion Foundry Supply Co., Toronto
Hamilton Facing Mill Co., Hamilton.
Hyde, Francis & Co., Montreal
Smith, J. D., Foundry Supply Co., Cleveland, Ohio.
Stevens, F. B., Detroit, Mich.

Core-Making Machines.

Falls Rivet & Machine Co., Cuyahoga Falls, Ohio.
Hyde, Francis & Co., Montreal
Smith, J. D., Foundry Supply Co., Cleveland, Ohio
Stevens, F. B., Detroit, Mich.

Core Ovens.

Detroit Foundry Supply Co., Windsor.
Dominion Foundry Supply Co., Montreal
Falls Rivet & Machine Co., Cuyahoga Falls, Ohio.
Hamilton Facing Mill Co., Hamilton.
Hyde, Francis & Co., Montreal
Sheldons Limited, Galt
Stevens, F. B., Detroit, Mich.
Whiting Foundry Equipment Co., Harvey, Ill.

Core Prints——Standard.

Falls Rivet & Machine Co., Cuyahoga Falls, Ohio.

Core Sand Cleaners.

Sly, W. W., Mfg. Co., Cleveland

Couplings.

Dodge Mfg. Co., Toronto
Gardner, Robt. & Son, Montreal
Owen Sound Iron Works Co., Owen Sound
Wilson, J. C., & Co., Glenora, Ont.

Couplings, Air.

Canadian Rand Co., Montreal.
Independent Pneumatic Tool Co., Chicago

Cranes, Electric and Hand Power.

Canada Foundry Co., Limited, Toronto
Canadian Rand Co., Montreal.
Dominion Foundry Supply Co., Montreal
Gardner, Robt. & Son, Montreal
Hamilton Facing Mill Co., Hamilton.
John McDougall, Caledonian Iron Works Co., Montreal.
Milroy-Harrison Co., Toronto.
Niles-Bement-Pond Co., New York.
Northern Engineering Works Detroit
Owen Sound Iron Works Co., Owen Sound
Smart-Turner-Machine Co., Hamilton.
Smith, J. D., Foundry Supply Co., Cleveland, Ohio.
Whiting Foundry Equipment Co., Harvey, Ill

Cranes, Hydraulic.

Whiting Foundry Equipment Co., Harvey, Ill.

Crank Pin Turning Machine.

London Mach. Tool Co., Hamilton.
Niles-Bement-Pond Co., New York.

Crucibles.

Detroit Foundry Supply Co., Windsor
Dominion Foundry Supply Co., Montreal
Goldschmidt Thermit Co., Toronto
Hamilton Facing Mill Co., Hamilton.
Hyde, Francis & Co., Montreal
Seidel, R. B., Inc. Philadelphia
Smith, J. D., Foundry Supply Co., Cleveland, Ohio.
Stevens, F. B., Detroit, Mich.

Crushers, Rock or Ore.

Allis-Chalmers-Bullock, Montreal.
Jeffrey Mfg. Co., Columbus, Ohio.

Cupolas.

Detroit Foundry Supply Co., Windsor
Dominion Foundry Supply Co., Montreal
De Clercy, J., Montreal
Hamilton Facing Mill Co., Hamilton.
Hyde, Francis & Co., Montreal
Northern Engineering Works, Detroit
Sheldons Limited, Galt.
Smith, J. D., Foundry Supply Co., Cleveland, Ohio.
Whiting Foundry Equipment Co. Harvey, Ill.

Cupola Blast Gauges.

Dominion Foundry Supply Co., Montreal
Sheldons Limited, Galt

Cupola Blocks.

Detroit Foundry Supply Co., Detroit.
Dominion Foundry Supply Co., Toronto
Hamilton Facing Mill Co., Hamilton
Hyde, Francis & Co., Montreal
Northern Engineering Works, Detroit
Ontario Lime Association Toronto

Cupola Blowers.

Canada Machinery Agency, Montreal.
Detroit Foundry Supply Co., Windsor
Dominion Foundry Supply Co., Toronto
Hamilton Facing Mill Co., Hamilton.
Hyde, Francis & Co., Montreal
Northern Engineering Works, Detroit
Sheldon's Limited, Galt.

Cupola Linings.

Maurer, Henry, & Son, New York.
Stevens, F. B., Detroit, Mich.

Cutters, Flue.

Independent Pneumatic Tool Co., Chicago Ill.

Cutters, Gear.

Milroy-Harrison Co., Toronto.

Cutter Grinder Attachment

Cincinnati Milling Machine Co., Cincinnati

Cutter Grinders.

Cincinnati Milling Machine Co., Cincinnati

Cutters, Milling.

Abbott, Wm., Montreal
Becker Milling Machine Co., Hyde Park, Mass.
Cleveland Twist Drill Co., Cleveland
Hamilton Tool Co., Hamilton, Ont.
Milroy-Harrison Co., Toronto.
National Twist Drill & Tool Co., Detroit
Owen Machine Tool Co., Springfield, Mass.
Pratt & Whitney Co., Hartford, Conn.
Standard Tool Co., Cleveland.

Cutting-off Machines.

Armstrong Bros. Tool Co., Chicago
John Bertram & Sons Co., Dundas, Ont.
Burke Machinery Co., Cleveland, Ohio
Canada Machinery Agency, Montreal.
Rice Lewis & Son, Toronto.
London Mach. Tool Co., Hamilton.
H. W. Petrie, Toronto.
Pratt & Whitney Co., Hartford, Conn.

Cutting-off Tools.

Armstrong Bros. Tool Co., Chicago.
London Mach. Tool Co., Hamilton.
H. W. Petrie, Toronto.
Pratt & Whitney, Hartford, Conn.
Rice Lewis & Son, Toronto.
L. S. Starrett Co., Athol, Mass.

Damper Regulators.

Darling Bros., Ltd., Montreal

Dies.

Acme Stamping & Tool Co., Hamilton
Armstrong Bros., Toronto
Banfield, W. H. & Son, Toronto
Bliss, E. W., Co., Brooklyn, N.Y.
Ferracute Machine Co., Bridgeton, N.J.
Gardner, Robt. & Son, Montreal
Cleal, Joseph P., Toronto
Hall J. H., & Sons, Brantford
Hall, Jas. B., Toronto
Scott, Ernest, Montreal.
Stevens Co., Galt

Die-Making Machinery.

Stevens Co., Galt, Ont.

Die Stocks.

Canadian Tap & Die Co., Galt
Curtis & Curtis Co., Bridgeport, Conn.
Hart Manufacturing Co., Cleveland, Ohio
Jardine, A. B., & Co., Hespeler, Ont.
Milroy-Harrison Co. Toronto.

Dies, Opening.

W. H. Banfield & Sons, Toronto
Jardine, A. B., & Co., Hespeler, Ont.
Pratt & Whitney Co., Hartford Conn.

Dies, Threading.

Canadian Tap & Die Co., Galt
Hart Mfg. Co., Cleveland
Jardine, A. B., & Co., Hespeler, Ont.
Milroy-Harrison Co., Toronto.

Draft, Mechanical.

W. H. Banfield & Sons, Toronto.
Butterfield & Co. Rock Island, Que.
A. B. Jardine & Co., Hespeler
Pratt & Whitney Co., Hartford, Conn.
Sheldons Limited, Galt.

Drawn Steel, Cold.

Union Drawn Steel Co., Hamilton.

Drilling Machines, Locomotive.

American Tool Works Co., Cincinnati.
John Bertram & Sons Co., Dundas, Ont.
Bickford Drill and Tool Co., Cincinnati.
The Canadian Fairbanks Co., Montreal.
A. B. Jardine & Co., Hespeler, Ont.
London Mach. Tool Co., Hamilton, Ont.
Lewis, Rice & Son. Toronto
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.
Williams & Wilson, Montreal

Drilling Machines, Multiple Spindle.

American Tool Works Co., Cincinnati.
John Bertram & Sons Co., Dundas, Ont.
Bickford Drill & Tool Co., Cincinnati.
Canada Machinery Agency Montreal.
Rice Lewis & Son, Toronto.
London Mach. Tool Co., Hamilton, Ont.
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.
Williams & Wilson, Montreal.

Drilling Machines, Radial.

American Tool Works Co., Cincinnati.
Bickford Tool & Drill Co., Cincinnati.
The Canadian Fairbanks Co., Montreal.
Rice Lewis & Son, Toronto
London Mach. Tool Co., Hamilton.
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.
Williams & Wilson, Montreal.

Drilling Machines, Turret.

John Bertram & Sons Co., Dundas, Ont.
London Mach. Tool Co., Hamilton.
Niles-Bement-Pond Co., New York.

Drilling Machines, Upright.

American Tool Works Co., Cincinnati.
John Bertram & Sons Co., Dundas, Ont.
Fox Machine Co., Grand Rapids
Hamilton Tool Co., Hamilton, Ont.
A. B. Jardine & Co., Hespeler, Ont.
Rice Lewis & Son, Toronto.
London Mach. Tool Co., Hamilton.

Drilling Machines, Horizontal.

John Bertram & Sons Co., Dundas, Ont.
Canada Machinery Agency, Montreal.
Lewis, Rice & Son, Toronto.
London Mach. Tool Co., Hamilton.
Niles-Bement-Pond Co., New York.

Drills, Bench.

Hamilton Tool Co., Hamilton, Ont.
Lewis, Rice & Son, Toronto.
London Mach. Tool Co., Hamilton.
Pratt & Whitney Co., Hartford, Conn.

Drills, Blacksmith.

Canada Machinery Agency, Montreal.
A. B. Jardine & Co., Hespeler, Ont.
London Mach. Tool Co., Hamilton.
National Twist Drill & Tool Co., Detroit
Standard Tool Co., Cleveland.

Drills, Centre.

Cleveland Twist Drill Co., Cleveland
Lewis, Rice & Son, Toronto.
Milroy Harrison Co., Toronto
National Twist Drill & Tool Co., Detroit
Pratt & Whitney Co., Hartford, Conn.
Standard Tool Co., Cleveland, O.
L. S. Starrett Co., Athol, Mass.

Drills, Coal and Plaster.

Cumming, J. W., New Glasgow, N.S.

Drills, Electric.

Canadian Pilling Co., Montreal
Niles-Bement-Pond Co., New York.

Drills, High Speed.

Abbott, Wm., Montreal
Cleveland Twist Drill Co., Cleveland
Alexander Gibb Montreal.
Lewis, Rice & Son, Toronto.
Lincoln-Williams Twist Drill Co., Taunton, Mass.
Milroy-Harrison Co., Toronto.
National Twist Drill & Tool Co., Detroit
Pratt & Whitney Co., Hartford, Conn.
Standard Tool Co., Cleveland, O.

Drills, Hand.

A. B. Jardine & Co., Hespeler, Ont.

Drills, Pneumatic.

Allen, John F., New York
Canada Machinery Agency, Montreal.
Canadian Rand Co., Montreal
Independent Pneumatic Tool Co., Chicago, New York
Niles-Bement-Pond Co., New York.

Drills, Ratchet.

Armstrong Bros. Tool Co., Chicago.
Cleveland Twist Drill Co., Cleveland
A. B. Jardine & Co., Hespeler,
Milroy-Harrison Co., Toronto.
National Twist Drill & Tool Co., Detroit
Pratt & Whitney Co., Hartford, Conn.
Standard Tool Co., Cleveland.

Drills, Rock.

Allis-Chalmers-Bullock, Montreal.
Canadian Rand Drill Co., Montreal.
Jeffrey Mfg Co., Columbus, Ohio.

Drills, Sensitive.

American Tool Works Co., Cincinnati.
Canada Machinery Agency, Montreal.
Fox Machine Co., Grand Rapids.
Lewis, Rice & Son, Toronto.
McKenzie, D., Guelph, Ont.
Niles-Bement-Pond Co., New York

Drills, Twist.

Abbott, Wm., Montreal.
Cleveland Twist Drill Co., Cleveland
Alex. Gibb, Montreal.
Lincoln-Williams Twist Drill Co., Taunton, Mass.
Milroy-Harrison Co., Toronto.
Morse Twist Drill and Machine Co., New Bedford, Mass.
National Twist Drill & Tool Co., Detroit
Pratt & Whitney Co., Hartford, Conn.
Standard Tool Co., Cleveland.
Whitman & Barnes Mfg. Co., St. Catharines, Ont.

Dry Kiln Cars.

Hammant Steel Car and Eng. Works, Hamilton.

Dry Kiln Equipment.

Sheldons Limited, Galt

Dump Cars.

Canada Foundry Co., Limited, Toronto
Dominion Foundry Supply Co., Montreal
Hamilton Facing Mill Co., Hamilton.
Hammant Steel Car and Eng. Works, Hamilton.
Hyde, Francis & Co., Montreal
Jeffrey Mfg. Co., Columbus, Ohio
Koppel, Arthur Co., New York
John McDougall, Caledonian Iron Works Co., Montreal.
Niles-Bement-Pond Co., New York.
Owen Sound Iron Works Co., Owen Sound
Waterous Engine Co., Brantford.

Dust Arresters.

Sly, W. W., Mfg. Co., Cleveland

Dynamos.

Allis-Chalmers-Bullock, Montreal.
Canadian General Electric Co., Toronto.
Canadian Westinghouse Co., Hamilton.
Hall Engineering Works, Montreal, Que.
Lewis, Rice & Son, Toronto.
Packard Electric Co., St. Catharines.
H. W. Petrie, Toronto.
T. & H. Electric Co., Hamilton.

Electrical Books.

American Industrial Pub. Co., Bridgeport, Conn.

Electrical Pyrometers.

Thwing, C. B., Philadelphia

Electrical Supplies.

Canadian General Electric Co., Toronto.
Canadian Westinghouse Co., Hamilton.
London Mach. Tool Co., Hamilton, Ont.
Packard Electric Co., St. Catharines.
T. & H. Electric Co., Hamilton.

Elevators.

Jeffrey Mfg Co., Columbus, Ohio
Whiting Foundry Equipment Co., Harvey, Ill.

Elevator Buckets.

Jeffrey Mfg. Co., Columbus, Ohio.

Emery and Emery Wheels.

Canadian Hart Wheels Ltd., Hamilton.
Dominion Foundry Supply Co., Montreal
Hamilton Facing Mill Co., Hamilton.
Hyde, Francis & Co., Montreal
Milroy-Harrison Co., Toronto.
Stevens, F. B., Detroit, Mich.

Emery Stands.

McKenzie, D., Guelph, Ont.

Emery Wheel Dressers.

Canadian Hart Wheels Ltd., Hamilton.
Canada Machinery Agency, Montreal.
Dominion Foundry Supply Co., Montreal
Gardner, Robt. & Son Montreal
Hamilton Facing Mill Co., Hamilton.
Hyde, Francis & Co., Montreal
Milroy-Harrison Co., Toronto.
H. W. Petrie, Toronto.
Standard Tool Co., Cleveland.

Engineering Books.

American Industrial Pub. Co., Bridgeport, Conn.

Engineers and Contractors.

Canada Foundry Co., Limited, Toronto.
Darling Bros., Ltd., Montreal
Dynamic Machine Works, Montreal.
Goldie & McCulloch Co., Galt, Ont.
Hall Engineering Works, Montreal.
Laurie Engine & Machine Co., Montreal.
John McDougall, Caledonian Iron Works Co., Montreal.
Robb Engineering Co., Amherst. N. S.
The Smart-Turner Mach. Co., Hamilton.
Taylor, James, New Glasgow, N. S.

Engineers' Supplies.

Hall Engineering Works, Montreal.
Rice Lewis & Son, Toronto.

Engines, Gas and Gasolene.

Canada Foundry Co., Toronto.
Canada Machinery Agency Montreal.
The Canadian Fairbanks Co., Montreal.
Goldie & McCulloch Co., Galt, Ont.
Jones & Glassco Montreal
Milroy-Harrison Co., Toronto.
Oliver, W. H., & Co., Toronto
Rice Lewis & Son, Toronto.
H. W. Petrie, Toronto.
The Smart-Turner Mach. Co., Hamilton

Engines, Oil.

Dinning & Eckinste'n, Montreal,
Jones & Glassco, Montreal

Engines, Steam.

Allis-Chalmers-Bullock, Montreal
Belliss & Marcom, Birmingham, Eng.
Canada Machinery Agency, Montreal.
The Goldie & McCulloch Co., Galt, Ont.
Rice Lewis & Son, Toronto.
Laurie Engine & Machine Co., Montreal.
John McDougall Caledonian Iron Works, Montreal.
Robb Engineering Co., Amherst, N.S.
Sheldons Limited, Galt.
The Smart-Turner Mach. Co., Hamilton.
Waterous Engine Works Co., Brantford.

Engine Lathes.

Schuchardt & Schutte, New York

Excavating Machinery.

Jeffrey Mfg Co., Columbus, Ohio

Exhaust Heads.

Darling Bros., Ltd., Montreal.
Sheldons Limited, Galt, Ont.
Standard Engineering Co., Toronto.

Fans, Electric.

Canadian General Electric Co., Toronto
Canadian Westinghouse Co., Hamilton.
Sheldons Limited Galt, Ont.
The Smart-Turner Mach. Co., Hamilton.

Fans, Exhaust.

Detroit Foundry Supply Co., Windsor.
Dominion Foundry Supply Co., Toronto
Hamilton Facing Mill Co., Hamilton.
Sheldons Limited, Galt.

Feed Water Heaters.

Darling Bros., Montreal
Laurie Engine & Machine Co., Montreal
John McDougall, Caledonian Iron Works Co., Montreal.
The Smart-Turner Mach. Co., Hamilton

Fillers (Metallic.)

Shelton Metallic Filler Co., Derby, Conn
Smooth-On Mfg. Co., Jersey City, N.J.
Stevens, F. B., Detroit Mich.

Fire Brick and Clay.

Detroit Foundry Supply Co., Windsor.
Dominion Foundry Supply Co., Toronto
Hyde, Francis, & Co., Montreal
Harbison Walker Refractories Co., Pittsburg
Hayes Run Fire Brick Co., Orvis, Pa.
Maurer, Henry, & Son, New York
Hamilton Facing Mill Co., Hamilton
Ontario Lime Association, Toronto
Penn Wm., Silica Works, Philadelphia,
Remmy, Richard C., Sons' Co., Philadelphia Pa.
Stevens, F. B., Detroit, Mich.

Fireproofing Hollowtile.

Maurer Henry, & Son, New York

Folding Rules.

Schuchardt & Schutte New York.

Forges.

Canada Foundry Co., Limited, Toronto.
Hamilton Facing Mill Co., Hamilton.
Independent Pneumatic Tool Co., Chicago, Ill.
Monarch Eng. Mfg. Co., Baltimore, Md.
H. W. Petrie, Toronto.
Sheldons Limited, Galt, Ont.

Forgings, Drop.

Bliss, E. W., Co., Brooklyn, N.Y.
John McDougall, Caledonian Iron Works Co., Montreal.
H. W. Petrie, Toronto.
Wilson, J. C., & Co, Glenora, Ont.

Forgings, Light & Heavy.

Hamilton Steel & Iron Co., Hamilton

Forging Machinery.

John Bertram & Sons Co., Dundas, Ont.
Bliss, E. W., Co., Brooklyn, N.Y.
London Mach. Tool Co., Hamilton, Ont
National Machinery Co., Tiffin, Ohio
Niles-Bement-Pond Co., New York.

Foundry Coke.

Baird & West, Detroit
Stevens, F. B., Detroit, Mich.

Foundry Equipment.

Detroit Foundry Supply Co., Windsor.
Dominion Foundry Supply Co., Toronto
Hamilton Facing Mill Co., Hamilton
Hyde Francis & Co., Montreal
Northern Engineering Works, Detroit
Stevens, F. B., Detroit, Mich.
Whiting Foundry Equipment Co., Harvey, Ill.

Foundry Parting.

Doggett, Stanley, New York
Dominion Foundry Supply Co., Toronto
Foundry Specialty Co., Cincinnati.
Hyde, Francis & Co., Montreal
Partomol Co., New York
Swoboda, L. J., New York.

Foundry Facings.

Detroit Foundry Supply Co., Windsor.
Dominion Foundry Supply Co., Toronto
Hamilton Facing Mill Co., Hamilton.
Hyde, Francis & Co. Montreal
Smith, J. D., Foundry Supply Co., Cleveland, Ohio.
Stevens, F. B., Detroit, Mich.

Friction Clutches.

Dodge, Mfg. Co., Toronto

Friction Clutch Pulleys, etc

The Goldie & McCulloch Co., Galt.

Furnaces.

Detroit Foundry Supply Co., Windsor.
Dominion Foundry Supply Co., Montreal
Hamilton Facing Mill Co., Hamilton.
Hyde Francis & Co., Montreal
Monarch Eng. & Mfg. Co., Baltimore
Northern Engineering Works, Detroit
Smith, J. D., Foundry Supply Co., Cleveland Ohio.
Stevens, F. B., Detroit, Mich.
Whiting Foundry Equipment Co., Harvey, Ill.

Furnaces, Brass.

Whiting Foundry Equipment Co., Harvey, Ill.

Gang Planer Tools.

Armstrong Bros. Tool Co., Chicago

Gas Blowers and Exhausters.

Sheldons Limited, Galt.

Gas Producer Plants.

Canada Foundry Co., Toronto
Gas & Electric Power Co., Toronto
Oliver, W. H., & Co., Toronto.
Jones & Glassco, Montreal
Williams & Wilson, Montreal

Gauges, Standard.

Cleveland Twist Drill Co. Cleveland
Pratt & Whitney Co., Hartford, Conn.

Gear-Cutting Machinery.

Armstrong Bros., Toronto
Becker Milling Mach. Co., Hyde Park, Mass.
Bickford Drill & Tool Co., Cincinnati.
Gould & Eberhardt, Newark, N.J
Lewis, Rice & Son, Toronto.
London Mach Tool Co., Hamilton
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto
Pratt & Whitney Co., Hartford, Conn.
Schuchardt & Schutte, New York
Stevens Co., Galt, Ont.
Williams & Wilson, Montreal.
Wilson, J. C., & Co., Glenora, Ont

Gear Hobbing Machines.

Gould, Eberhardt & Newark, N.J.

Gears, Angle.

Boston Gear Works Norfolk Downs, Mass.
Gardner, Robt., & Son, Montreal
Goldie & McCulloch Co., Galt, Ont.
Gould & Eberhardt, Newark, N.J.
Laurie Engine & Machine Co., Montreal.
John McDougall, Caledonian Iron Works Co., Montreal.
Waterous Engine Co., Brantford.
Wilson, J. C., & Co., Glenora, Ont.

Gears, Cut.

Boston Gear Works, Norfolk Downs, Mass
Dynamic Machine Works, Montreal
Gardner, Robt., & Son, Montreal
Goldie & McCulloch Co., Galt, Ont.
Gould & Eberhardt, Newark, N.J.
Horsburgh & Scott Co., Cleveland
New Process Raw Hide Co., Syracuse, N.Y.
Wilson, J. C., & Co., Glenora, Ont.

Gears, Mortise.

Boston Gear Works, Norfolk Downs, Mass.
Gardner, Robt., & Son, Montreal
Goldie & McCulloch Co., Galt, Ont.
New Process Raw-Hide Co., Syracuse, N.Y.
Wilson, J. C., & Co., Glenora, Ont.

Gears, Rawhide.

Gardner Robt., & Son, Montreal
Goldie & McCulloch Co., Galt, Ont.
Horsburgh & Scott Co., Cleveland
New Process Raw-Hide Co., Syracuse, N.Y.

Gears, Worm.

Dynamic Machine Works, Montreal
Gardner Robt., & Son, Montreal
Gould & Eberhardt, Newark, N.J.
Horsburgh & Scott Co., Cleveland
Wilson J. C., & Co., Glenora, Ont.

Generators, Electric.

Allis-Chalmers-Bullock, Limited, Montreal
Canadian General Electric Co., Toronto
Canadian Westinghouse Co., Hamilton.
Gas & Electric Power Co., Toronto
Hall Engineering Works, Montreal.
H. W. Petrie, Toronto.
Toronto & Hamilton Electric Co. Hamilton.

Governors, Water Wheel.

Wilson, J. C., & Co., Glenora, Ont.

Graphite.

Detroit Foundry Supply Co., Windsor.
Dominion Foundry Supply Co., Toronto
Hamilton Facing Mill Co., Hamilton.
Stevens, F. B., Detroit, Mich.

Grease Cups.

Peterboro Lubricator Mfg. Co., Peterboro, Ont.

Grinders, Automatic Knife.

Canadian Hart Wheels Ltd., Hamilton.
W. H. Banfield & Son, Toronto.

Grinders, Bench.

Canadian Hart Wheels Ltd. Hamilton.
McKenzie, D., Guelph, Ont.
Hall, J. H., & Sons, Brantford.
Lewis, Rice & Son, Toronto

Grinders, Centre.

Canadian Hart Wheels Ltd., Hamilton.
Lewis, Rice & Son, Toronto.
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.

Grinders, Cutter.

Becker Milling Mach. Co., Hyde Park Mass.
Gould & Eberhardt, Newark, N.J.
Lewis, Rice & Son, Toronto.
Pratt & Whitney Co., Hartford, Conn.

Grinders, Disc.

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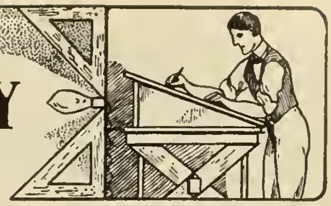

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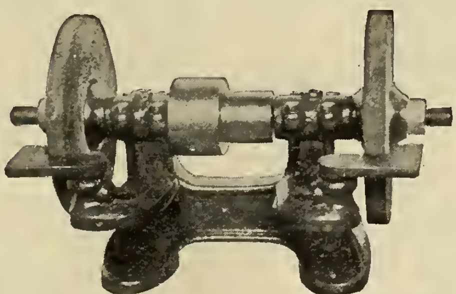

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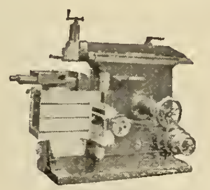

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National Twist Drill & Tool Co., Detroit
Pratt & Whitney Co., Hartford, Conn.
Standard Tool Co., Cleveland.
Whitman & Barnes Mfg. Co., St. Catharines, Ont.

Reamers, Adjustable.

Cleveland Twist Drill Co., Cleveland
Lapointe Machine Tool Co., Hudson, Mass.
Milroy-Harrison Co., Toronto.
Pratt & Whitney Co., Hartford, Conn.

Reamers, Bridge.

Lincoln-Williams Twist Drill Co., Taunton, Mass.

Reamers, Pipe.

Canadian Tap & Die Co., Galt.
Milroy-Harrison Co. Toronto.
Whitman & Barnes Mfg. Co , St. Catharines, Ont.

Reamers, Steel Taper.

Butterfield & Co., Rock Island.
A. B. Jardine & Co., Hespeler, Ont.
John Millen & Son Ltd., Montreal.
Milroy-Harrison Co., Toronto.
National Twist Drill & Tool Co., Detroit
Pratt & Whitney Co., Hartford, Conn.
Standard Tool Co., Cleveland.
Whitman & Barnes Mfg. Co., St. Catharines, Ont.

Rheostats.

Canadian General Electric Co., Toronto.
Canadian Westinghouse Co., Hamilton.
Hall Engineering Works, Montreal, Que.
T. & H. Electric Co., Hamilton,

Riddles.

Detroit Foundry Supply Co., Windsor
Dominion Foundry Supply Co., Toronto
Hamilton Facing Mill Co., Hamilton.
Hyde, Francis & Co., Montreal
Stevens, F. B., Detroit, Mich.

Riveters, Hydraulic.

Allen, John F., New York

Riveters, Pneumatic.

Allen, John F., New York
Bliss, E. W., Co., Brooklyn, N.Y.
Independent Pneumatic Tool Co. Chicago, Ill.

Rolls, Bending.

John Bertram & Sons Co., Dundas, Ont.
London Mach. Tool Co., Hamilton, Ont.
Niles-Bement-Pond Co., New York.

Rope, Driving.

Dodge Mfg. Co., Toronto

Rotary Converters.

Allis-Chalmers-Bullock, Ltd., Montreal.
Canadian Westinghouse Co., Hamilton
Toronto and Hamilton Electric Co., Hamilton.

Rubbing Stones.

Canadian Hart Wheels Ltd., Hamilton

Sand Blast Machinery.

Canadian Rand Co., Montreal.
Detroit Foundry Supply Co., Windsor
Dominion Foundry Supply Co., Montreal
Hamilton Facing Mill Co., Hamilton.
Hyde, Francis & Co., Montreal.

Sand, Molding.

Albany & No. River Molding Sand Co. Albany N.Y.
Detroit Foundry Supply Co , Windsor
Dominion Foundry Supply Co., Montreal
Hamilton Facing Mill Co., Hamilton.
Hyde, Francis & Co., Montreal.
Stevens, F., B., Detroit, Mich.

Sand Sifters.

Detroit Foundry Supply Co., Windsor
Dominion Foundry Supply Co., Montreal
Hamilton Facing Mill Co., Hamilton.
Hyde, Francis & Co , Montreal.
Stevens, F, B., Detroit, Mich.

Saw Mill Machinery.

Allis-Chalmers-Bullock, Limited, Montreal
Canada Machinery Agency Montreal
Fay, J. A , & Egan Co , Cincinnati
Gardner R bt., & Son. Montreal
Goldie & McCulloch Co. Galt.
Jeffrey Mfg. Co., Columbus. Ohio.
Owen Sound Iron Works Co., Owen Sound
H W Petrie, Toronto.
Robb Engineering Co., Amherst Ont.
Waterous Engine Works. Brantford

Williams & Wilson Montreal.
Wilson, J. O., & Co., Glenora, Ont

Saw Filing Machines.

Canadian Hart Wheels Ltd., Hamilton

Saws, Hack.

Canada Machinery Agency, Montreal.
Detroit Foundry Supply Co., Windsor
London Mach. Tool Co., Hamilton
Rice Lewis & Son, Toronto.
McKenzie, D., Guelph, Ont
Milroy-Harrison Co., Toronto.
Simonds Canada Saw Co.. Montreal.
L. S. Starrett Co., Athol, Mass.

Scientific Books.

American Industrial Pub. Co , Bridgeport, Conn.

Screw-Cutting Tools.

Milroy-Harrison Co., Toronto.

Screw Machines, Automatic.

Canada Machinery Agency, Montreal.
London Mach. Tool Co., Hamilton, Ont.
National-Acme Mfg. Co , Cleveland.
Pratt & Whitney Co., Hartford, Conn.

Screw Machines, Hand.

Canada Machinery Agency. Montreal.
A. B. Jardine & Co., Hespeler.
London Mach. Tool Co., Hamilton, Ont.
Pratt & Whitney Co., Hartford, Conn.
Warner& Swasey Co., Cleveland, O.

Screw Machines, Multiple Spindle.

National-Acme Mfg Co., Cleveland

Screw Plates.

Butterfield & Co., Rock Island, Que.
Canadian Tap & Die Co., Galt
Hart Manufacturing Co. Cleveland, Ohio
A B. Jardine & Co.,Hespeler
Milroy-Harrison Co , Toronto.

Screw Slotting Machinery, Semi-Automatic.

National-Acme Mfg. Co., Cleveland

Shafting.

Canada Machinery Agency, Montreal
The Canadian Fairbanks Co., Montreal.
Dodge Mfg. Co , Toronto
Fay, J. A., & Egan Co., Cincinnati
Gardner, Robt., & Son , Montreal
The Goldie & McCulloch Co., Galt, Ont
Niles-Bement-Pond Co., New York.
Owen Sound Iron Works Co., Owen Sound
H. W. Petrie, Toronto.
Smart-Turner Machine Co., Hamilton.
Union Drawn Steel Co., Hamilton.
Waterous Engine Co., Brantford.
Wilson, J. C., & Co., Glenora, Ont.

Shapers.

American Tool Works Co., Cincinnati.
John Bertram & Sons Co., Dundas, Ont
Canada Machinery Agency, Montreal.
The Canadian Fairbanks Co., Montreal.
Cincinnati Shaper Co.. Cincinnati, Ohio
Gardner Robt , & Son, Montreal
Gould & Eberhardt Newark N.J.
Rice Lewis & Son, Toronto.
London Mach. Tool Co., Hamilton, Ont
McKenzie, D., Guelph, Ont.
Niles-Bement-Pond Co., New York.
H W. Petrie, Toronto.
Pratt & Whitney Co., Hartford, Conn.
Stockbridge Machine Co., Worcester
Williams & Wilson, Montreal.

Shaper Attachments.

Stockbridge Machine Co., Worcester, Mass.

Sharpening Stones.

Canadian Hart Wheels Ltd. Hamilton.
Carborundum Co., Niagara Falls, N.Y.

Shearing Machine, Bar.

John Bertram & Sons Co., Dundas, Ont.
Ferracute Machine Co., Bridgeton N.J.
A. B. Jardine & Co , Hespeler.
London Mach. Tool Co., Hamilton, Ont.
Niles-Bement-Pond Co., New York.

Shears, Metal Cutting.

Schuchardt & Schutte. New York.

Shears, Power.

John Bertram & Sons Co., Dundas, Ont
Bliss, E. W., Co., Brooklyn, N.Y.
Canada Machinery Agency Montreal
Ferracute Machine Co., Bridgeton, N.J.
Niles-Bement-Pond Co., NewYork.

Shears, Pneumatic.

Allen, John F.. New York.

Sheet Metal Working Tools

Bliss, E W., Co , Brooklyn. N Y
Brown. Boggs Co , Hamilton
Consolidated Press & Tool Co., Hastings, Mich.
Ferracute Machine Co , Bridgeton, N.J

Side Tools.

Armstrong Bros Tool Co., Chicago

Sieves.

Detroit Foundry Supply Co., Windsor
Dominion Foundry Supply Co., Montreal
Hamilton Facing Mill Co., Hamilton.
Hyde, Francis & Co., Montreal

Silver Lead.

Detroit Foundry Supply Co., Windsor
Dominion Foundry Supply Co., Toronto
Hamilton Facing Mill Co., Hamilton.
Hyde, Francis & Co., Montreal

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Dill, T. C., Machine Co., Philadelphia

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Schuchardt & Schutte, New York.

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Detroit Foundry Supply Co., Windsor
Dominion Foundry Supply Co., Toronto
Hamilton Facing Mill Co., Hamilton.
Hyde, Francis & Co. Montreal
Smith, J. D., Foundry Supply Co , Cleveland, Ohio

Sockets.

Cleveland Twist Drill Co., Cleveland

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Lumen Bearing Co., Toronto

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W. H. Banfield & Sons, Toronto.
John Bertram & Sons Co. Dundas, Ont.
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Brown, Boggs Co. Hamilton
Cleal, Joseph P , Toronto
Canadian Hart Wheels Ltd., Hamilton.
Dynamic Machine Works, Montreal.
Ferracute Machine Co., Bridgeton, N.J.
Gardner Robt., & Son Montreal
Hall, James B , Toronto
Hall, J. H., & Sons, Brantford.
Jardine, A. B., & Co , Hespeler, Ont.
Laurie Engine & Machine Co., Montreal.
London Mach. Tool Co., Hamilton. Ont.
McKenzie, D., Guelph. Ont.
H. W. Petrie, Toronto.
Scott, Ernest, Montreal.
The Smart-Turner Mach. Co., Hamilton
Special Machinery Mfg Co., Montreal.
Stevens Co , Galt, Ont
Waterous Engine Co., Brantford.
Wilson, J. C., & Co., Glenora Ont.

Speed Indicators.

Schuchardt & Schutte, New York.

Spike Machines.

National Machinery Co., Tiffin, O.
The Smart-Turner Mach. Co., Hamilton

Spring Cotters.

Whitman & Barnes Mfg. Co., St. Catharines, Ont.

Springs, Coiled Wire.

Cleveland Wire Spring Co., Cleveland

Springs, Machinery.

Cleveland Wire Spring Co., Cleveland

Sprocket Chain.

Dodge Mfg. Co. Toronto

Sprocket Wheels.

Dodge Mfg. Co. Toronto
Wilson, J. C., & Co., Glenora, Ont.

Sprue Cutters.

Bliss E. W , Co., Brooklyn, N.Y.
Detroit Foundry Supply Co., Windsor
Dominion Foundry Supply Co., Montreal
Hamilton Facing Mill Co., Hamilton.
Hyde, Francis & Co , Montreal
Smith, J. D., Foundry Supply Co., Cleveland, Ohio.
Stevens F. B., Detroit, Mich.

Spur Wheels.

Wilson, J. C., & Co., Glenora Ont.

Stamp Mills.

Allis-Chalmers-Bullock, Limited, Montreal

Steam Engineering Books.

American Industrial Pub. Co., Bridgeport, Conn.

Steam Separators.

Darling Bros., Ltd , Montreal.
Robb Engineering Co , Montreal.
Sheldon's Limited, Galt.
Smart-Turner Mach. Co., Hamilton
Waterous Engine Co., Brantford.

Steam Specialties.

Darling Bros., Ltd., Montreal
Sheldon's Limited, Galt
Standard Engineering Co , Toronto

Steam Traps.

Canada Machinery Agency. Montreal
Darling Bros., Ltd., Montreal
Sheldons Limited, Galt.

Steel Furnaces.

Monarch Eng & Mfg Co , Baltimore,Md

Steel Pressure Blowers.
Dominion Foundry Supply Co., Montreal
Hamilton Facing Mill Co., Hamilton.
Sheldon's Limited, Galt.

Steel, High Speed.
Canadian Fairbanks Co., Montreal.
Alex. Gibh, Montreal.
Jessop, Wm., & Sons, Sheffield, Eng.
Milroy-Harrison Co., Toronto.
B. K. Morton Co., Sheffield, Eng.
Richardson, John L., & Co , Toronto
Williams & Wilson, Montreal.

Switchboards.
Allis-Chalmers-Bullock, Limited, Montreal
Canadian General Electric Co., Toronto.
Canadian Westinghouse Co., Hamilton.
Hall Engineering Works, Montreal, Que,
Hill Electric Switch Co , Montreal
Toronto and Hamilton Electric Co., Hamiton.

Switches, Electric.
Hill Electric Switch Co., Montreal

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Schuchardt & Schutte, New York.

Talc.
Detroit Foundry Supply Co., Windsor.
Dominion Foundry Supply Co., Toronto
Hamiton Facing Mill Co., Hamilton.
Hyde, Francis & Co., Montreal
Smith, J. D., Foundry Supply Co. Cleveland, Ohio.

Tanks, Steel.
Goldie & McCulloch Co., Galt, Ont.

Tap Wrenches.
Canadian Tap & Die Co., Galt.

Tapping Machines and Attachments
American Tool Works Co., Cincinnati.
John Bertram & Sons Co., Dundas, Ont.
Bickford Drill & Tool Co., Cincinnati.
Blair Tool & Machine Works, New York.
The Geometric Tool Co., New Haven,
A. B. Jardine & Co., Hespeler.
Lewis, Rice & Son, Toronto.
London Mach. Tool Co., Hamilton, Ont
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.
Pratt & Whitney, Cincinnati, O.
L. S. Starrett Co., Athol, Mass.
Williams & Wilson, Montreal.

Taps, Collapsing.
The Geometric Tool Co., New Haven

Taps, Adjustable.
Lapointe Machine Tool Co., Hudson, Mass.

Taps, Screw.
Whitman & Barnes Mfg. Co., St. Catharines, Ont.

Taps and Dies.
Wm. Abbott, Montreal.
Butterfield & Co., Rock Island, Que.
Canadian Tap & Die Co., Galt, Ont.
Cleveland Twist Drill Co., Cleveland
A. B. Jardine & Co., Hespeler, Ont.
Rice Lewis & Son, Toronto.
John Millen & Son, Ltd , Montreal.
Milroy-Harrison Co , Toronto.
Pratt & Whitney Co., Hartford, Conn.
Standard Tool Co., Cleveland.
L. S. Starrett Co., Athol, Mass.

Technical Books.
American Industrial Pub. Co. Bridgeport, Conn.

Testing Laboratories.
Toronto Testing Laboratory, Toronto

Thread-Cutting Tools.
Canadian Tap & Die Co., Galt.
Hall John H , & Son, Brantford, Ont.
Hart Manufacturing Co., Cleveland, Ohio

Tiling, Opal Glass.
Toronto Plate Glass Importing Co., Toronto.

Tire Upsetters or Shrinker
A. B. Jardine & Co. Hespleer, Ont.

Tool Holders.
Armstrong Bros. Tool Co., Chicago.
Cleveland Twist Drill Co., Cleveland
John Millen & Son, Ltd , Montreal.
Milroy-Harrison Co., Toronto.
H. W. Petrie, Toronto.
Pratt & Whitney Co., Hartford, Conn.

Tool Posts, Lathe.
Armstrong Bros. Tool Co., Chicago

Tool Steel.
Canadian Fairbanks Co., Montreal
Flockton, Tompkin & Co., Sheffield, Eng.
Alexander Gibb, Montreal.
Wm. Jessop, Sons & Co., Toronto.
Milroy-Harrison Co., Toronto.
B. K. Morton & Co., Sheffield, Eng.
Williams & Wilson, Montral.

Tools, Lathe, Planer and Slotter.
Armstrong Bros. Tool Co , Chicago

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Detroit Foundry Supply Co., Windsor.
Dominion Foundry Supply Co., Montreal
Hamilton Facing Mill Co., Hamilton.
Stevens, F. B., Detroit Mich

Track, Overhead.
Whiting Foundry Equipment Co., Harvey, Ill.

Transformers and Convertors
Allis-Chalmers-Bullock, Montreal.
Canadian General Electric Co., Toronto.
Canadian Westinghouse Co., Hamilton.
Hal Engineering Works, Montreal, Que
T. & H. Electric Co., Hamilton.

Transmission Machinery.
Allis-Chalmers-Bullock, Montreal.
The Canadian Fairbanks Co., Montreal
Dodge Mfg Co., Toronto
Goldie & McCulloch Co., Galt, Ont.
Laurie Engine & Machine Co., Montreal
Lewis, Rice & Son. Toronto.
H. W. Petrie, Toronto.
The Smart-Turner Mach. Co., Hamilton
Waterous Engine Co., Brantford.
Wilson, J. C., & Co., Glenora Ont.

Trolleys.
Canadian Rand Co., Montreal.
Dominion Foundry Supply Co., Montreal
Hyde, Francis & Co , Montreal
John Millen & Son, Ltd., Montreal.
Northern Engineering Works Detroit
Whiting Foundry Equipment Co., Harvey, Ill.

Trolley Wheels.
Lumen Bearing Co., Toronto

Trucks, Dryer and Factory.
Hammant Steel Car and Eng. Works, Hamilton.
Northern Engineering Works Detroit
Sheldon's Limited, Galt, Ont.

Tube Expanders (Rollers).
A. B. Jardine & Co , Hespeler.

Turbines, Steam.
Allis-Chalmers-Bullock, Limited, Montreal
Canadian General Electric Co., Toronto.
Canadian Westinghouse Co., Hamilton.

Turntables.
Detroit Foundry Supply Co., Windsor.
Dominion Foundry Supply Co., Toronto
Hamilton Facing Mill Co., Hamilton.
Hammant Steel Car and Eng. Works, Hamilton.
Hyde, Francis & Co , Montreal
Northern Engineering Works, Detroit
Stevens, F. B., Detroit Mich.
Whiting Foundry Equipment Co., Harvey, Ill.

Turret Lathes.
Schuchardt & Schutte, New York.

Valves, Back Pressure.
Darling Bros., Ltd., Montreal
Sheldon's Limited, Galt.

Upright Drills.
Schuchardt & Schutte, New York.

Upsetting and Bending Machinery
John Bertram & Sons Co., Dundas, Ont.
A. B. Jardine & Co., Hespeler.
London Mach. Tool Co., Hamilton, Ont.
National Machinery Co., Tiffin, O.
Niles-Bement-Pond Co., New York.

Valves, Steam.
Darling Bros, Montreal

Valve Reseating Machines.
Darling Bros. Ltd., Montreal

Ventilating Apparatus.
Canada Machinery Agency, Montreal
Darling Bros., Ltd., Montreal
Sheldon's Ltd., Galt

Vises, Bench.
Dynamic Machine Works, Montreal.
Hall, John H., & Son, Brantford, Ont.
Hollands Mfg. Co , Erie, Pa.
Stevens Co., Galt, Ont.

Vises, Drill.
Stevens Co., Galt, Ont.

Vises, Milling Machines.
Stevens Co., Galt, Ont.

Vises, Planer and Shaper.
American Tool Works Co., Cincinnati, O.
Niles-Bement-Pond Co., New York.

Washer Machines.
National Machinery Co., Tiffin, Ohio.

Water Wheels.
Allis-Chalmers-Bullock Co., Montreal.
Canada Machinery Agency, Montreal.
John McDougall Caledonian Iron Works Co., Ltd., Montreal
Wilson, J. C., & Co. Glenora, Ont.

Water Wheels, Turbine.
Wilson, J. C., & Co , Glenora, Ont.

Welding Processes.
Goldschmidt Thermit Co., Montreal

Wheelbarrows.
Buffalo Foundry Supply Co., Buffalo
Detroit Foundry Supply Co., Windsor.
Dominion Foundry Supply Co , Toronto
Hamilton Facing Mill Co., Hamilton.
Hyde, Francs & Co., Montreal

ALPHABETICAL INDEX

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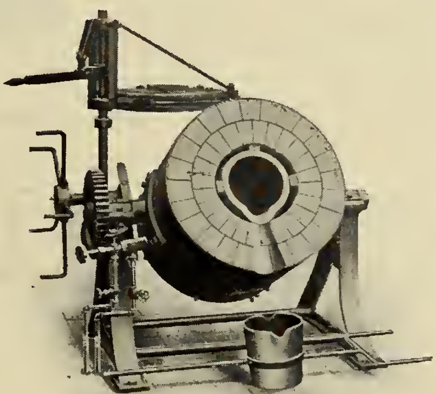
and it is. Our "advertising pleas" are being liberally responded to. The LEADING INTERESTS, comprising Railroad, Cobalt Mining, Foundries, Forge and Machine Shops, Locomotive, Cyanide Precipitates, etc., are specifying and ordering our economical line of FOUNDRY, MINE and SHOP equipment. Think of it! Break away from the antiquated past. The "Toronto" foundry exhibit opened your eyes. Make a dollar instead of fifty cents by using our goods. Dispense with coal or coke, use "oil, or gas and air," cleanliness and not dirt. The good times are coming. The live awake man is renovating. Wake up—you are not too old to improve. We have helped others, we will help you to save

50% by our { "MONARCH" MODERN METHODS }

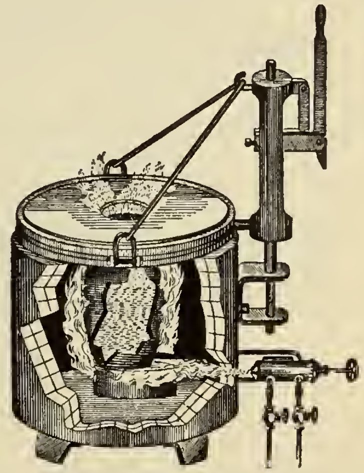
Install our

"STEELE-HARVEY" CRUCIBLE TILTING MELTING FURNACES

MELTING POSITION.



POURING POSITION.



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Now universally recognized as the ONLY PRACTICAL furnaces on the market for brass, copper, bronze, nickel and ferro alloys, mining and smelting. Capacities 100 to 1,600 lbs. per heat. We build also

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Lifting Out Crucible (if preferred), Rivet Heating, Case Hardening, Galvanizing, Soft Metal Melting, Annealing, Tempering, Bar Iron, Angle Iron, Horse Shoes, Bolt Heating, Open Hearth Steel, Ladle Heaters, Burners, Blowers, Tanks, etc.

PRICES LOW SHIPMENTS PROMPT SETTLEMENTS AGREEABLE

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Works: Curtis Bay, Md.

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IN THE SAVING OF TIME AND MONEY

THE

"REID" Hand-Rammed, Stripping Plate MOLDING MACHINE

EXCELS ALL OTHERS.

12-in. Machine
Front view, showing pattern frame down

¶ This fact has been demonstrated to the absolute satisfaction of a large number of the more prominent foundrymen of the United States and Canada. The superintendent of one of the largest foundries in the United States, who has used all styles of machines, says that the "REID" is the cheapest, most rigid, and most perfect draw-down machine he ever saw.

¶ Send for our booklet. It gives in actual detailed figures the saving accomplished by the Reid Molding Machine in one foundry.

We make a specialty of contracting for Machine Molded Castings in grey iron—brass—or semi-steel—delivered to any place in Canada.

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The Reid Foundry & Machine Co., Limited, - Ingersoll, Ontario

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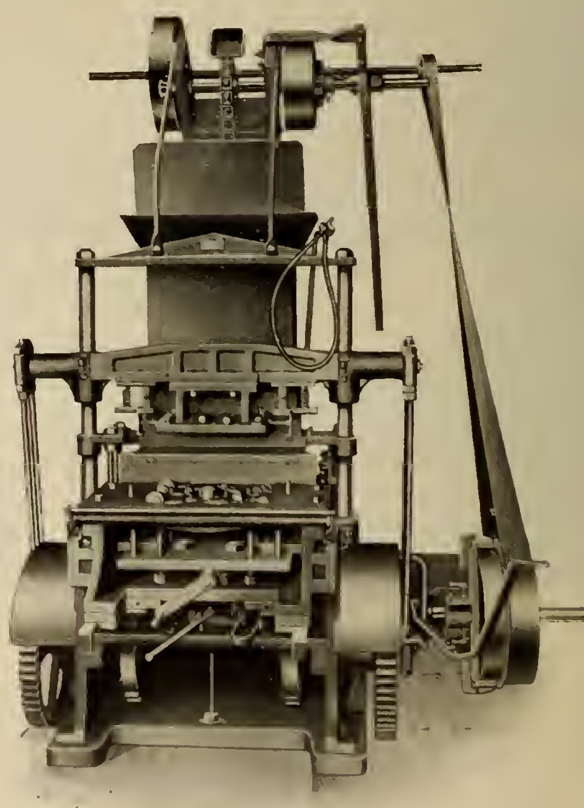
BERKSHIRE

AUTOMATIC

MOLDING MACHINE

As Shown at the A. F. A. Convention, Toronto, Can.



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Write us about our Aluminum Snap Flasks and Rotary Riddles.

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It's Money in Your Pocket

TO USE A FILLER THAT FILLS TO STAY FILLED

Shelton Metallic Filler becomes a part of the casting itself, taking the same finish, passing every inspection. Simple and easy to use. Always to be depended on—fifteen years of success proves its superiority.

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A Sample Can Free

Shelton Metallic Filler Co.

Derby, Conn.

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DRUMMOND & McCALL
MONTREAL and TORONTO
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SHELTON METALLIC FILLER

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TRADE MARK—REG. U. S. PAT. OFF.

Pump Repaired with Smooth-on Iron Cement No. 1 six years ago, and still in use.

Write for circular showing how work was done.

SMOOTH-ON IRON CEMENT No. 1

is prepared in powdered form—for use mix with water. It is unequaled for stopping leaks of Steam, Water, Fire or Oil, because it becomes metallic iron that has the same expansion and contraction as iron, thus keeping tight at all temperatures. Engineers and Foundrymen use it where a smooth surface and metal-like hardness are desired.

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Cheapest and Best Cement on the Market for Foundry Use.

Sold in Yellow Label Cans.

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SMOOTH-ON MANUFACTURING CO., JERSEY CITY, N. J. U.S.A.

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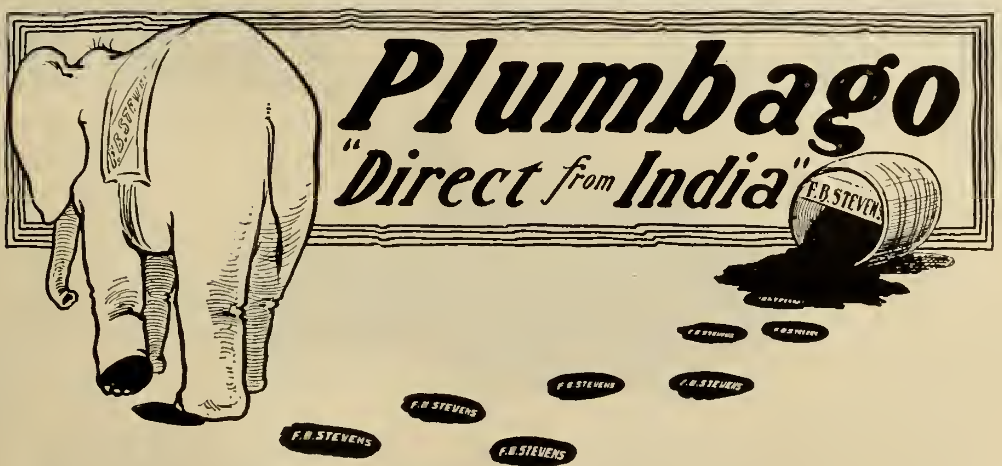

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Stevens' Pure Plumbago

has left its foot prints all over the land. The same foot prints are shown in the reduced cost, in the cleaning room and with the chipping gang : : : : : : :

You can reduce your own expense in your Foundry in the same way by using my plumbago. It's the "pure quill" from India's coral strand. Both quality and price are attractive.
TRY A BARREL AT MY RISK; YOU ARE TO BE SUITED OR YOU NEED NOT PAY.

I manufacture Foundry Facings and Supplies, Buffing Compositions and Platers' Supplies, and they all bear the stamp of quality.

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Warehouse and Office
Cor. Larned and Third Sts.

Export Warehouse
Windsor, Ont.

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The marvellous results obtained from the use of our Drills are facts, not theories.

Write us for Catalogue and Discount Sheets.

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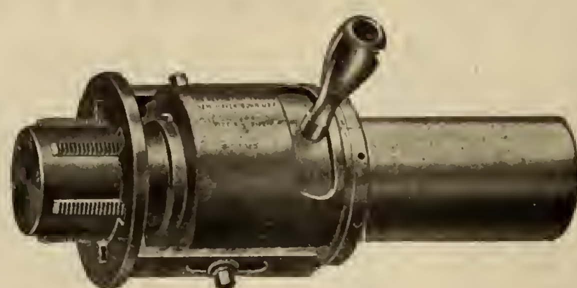
WELL KNOWN BRANDS MADE IN CANADA BY

AMERICAN
ARCADE
KEARNEY and FOOT
McCLELLAN

GLOBE
EAGLE
GREAT WESTERN
J. B. SMITH

Dominion Works, Port Hope, Ont.

BACKING OUT TAPS CONSUMES JUST AS MUCH TIME AS RUNNING THEM IN



Therefore, after a hole is tapped to the desired depth with a solid Tap, there still remains more work to be done—the Tap must be backed out, which is an extremely risky operation. Tap may be ruined, thread may be ruined, or both may be ruined for all you know.

The Geometric Adjustable Collapsing Taps can be instantly withdrawn as soon as the depth of thread is reached.

This is done by means of an adjustable gauge, which is set to govern the depth of tapping required, and as the work comes in contact with the gauge, the chasers are instantly released and disappear into the body of the Tap, which permits the Tap to be withdrawn without stripping or marring the thread.

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The Geometric Tool Co., New Haven, Conn. U.S.A.

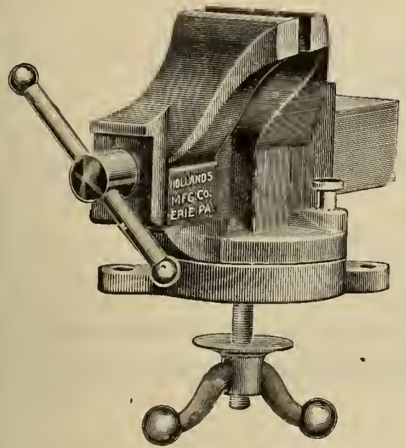
Canadian Agents: WILLIAMS & WILSON, Montreal, Que.

HOLLANDS MFG. CO.

ERIE, Pa.

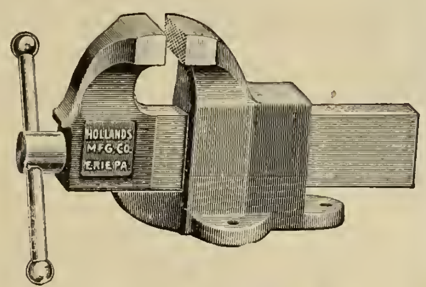
HIGH-GRADE

Machinists' and Plumbers' Tools



Drill Press Vise. Malleable Front Jaw

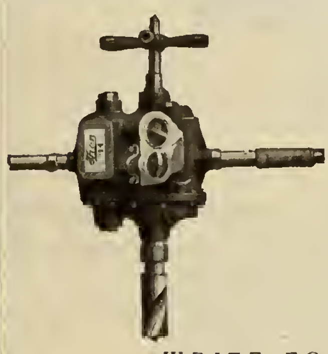
Send for Catalogue and Prices.



Hollands Standard Machinist's Vise

Thor

This Name is the **Strongest Guarantee** a Pneumatic Drill Can Have



It stands for power, durability, efficiency and economy. It stands for the greatest amount of work in the shortest time at the minimum cost. In short, it stands for the best Piston Air Drill in the world.

WRITE FOR CATALOG

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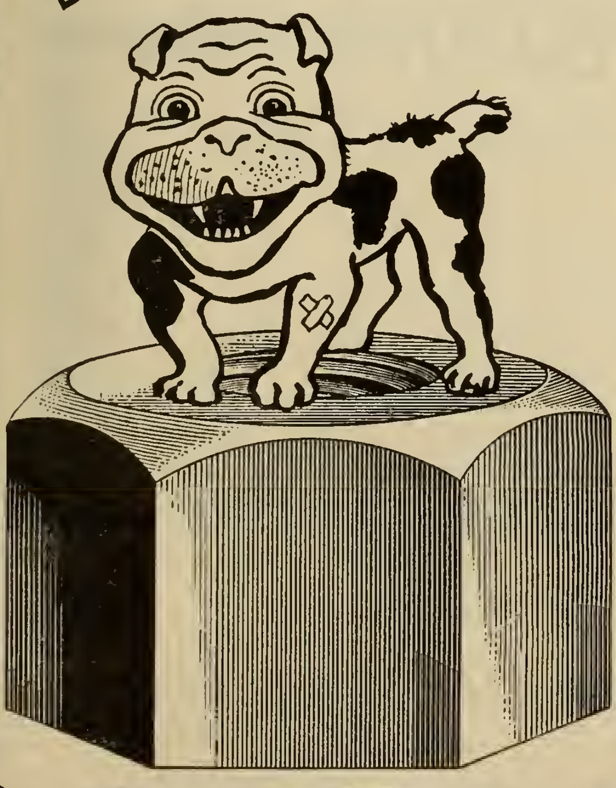

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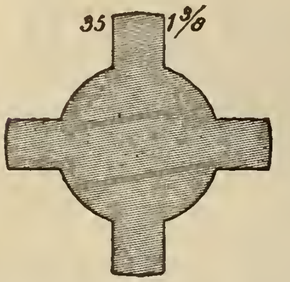

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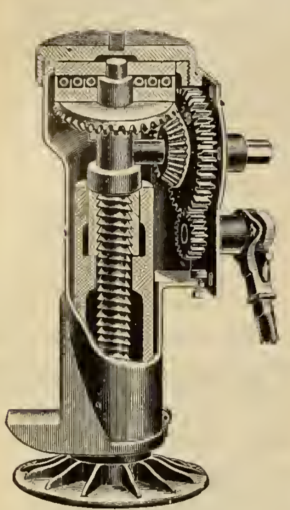

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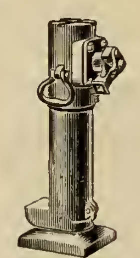

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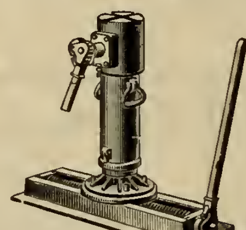

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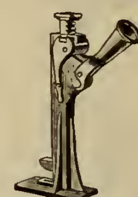

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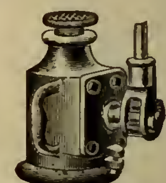

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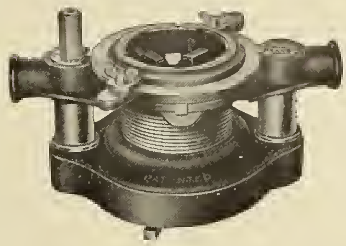

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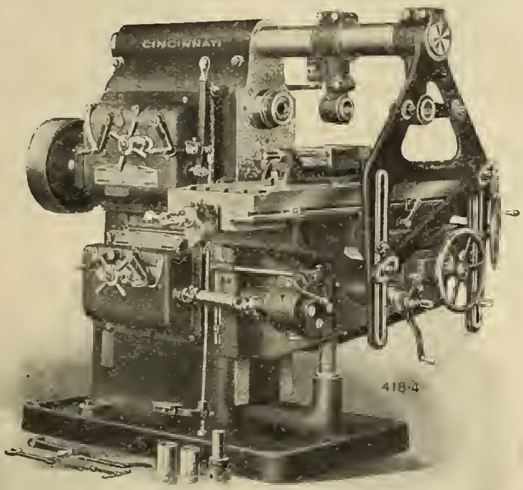

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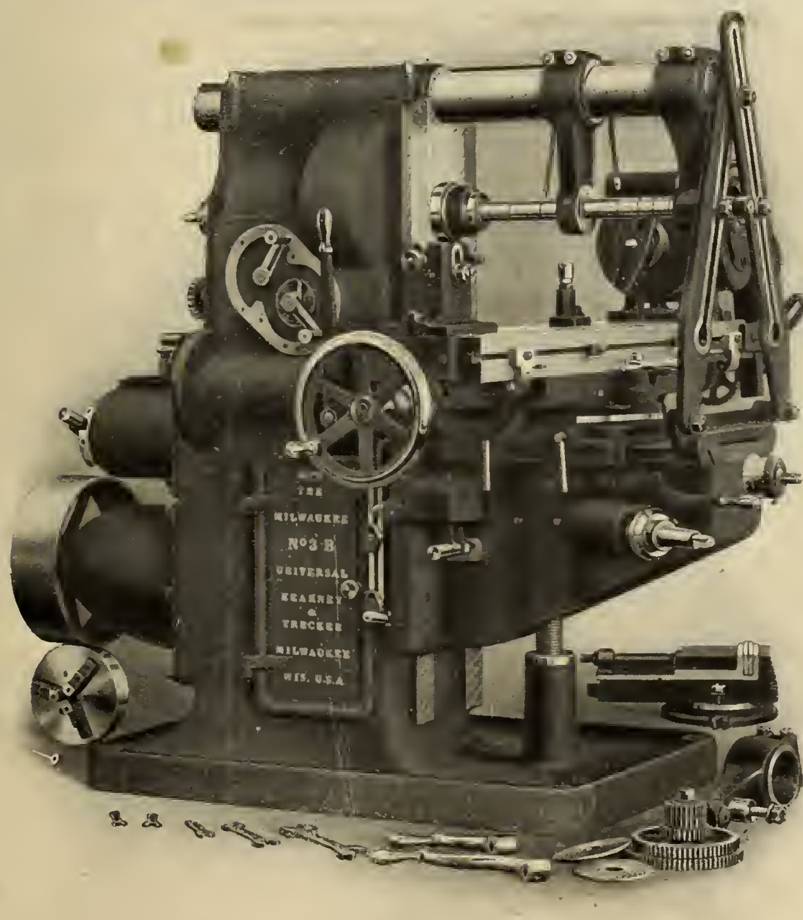

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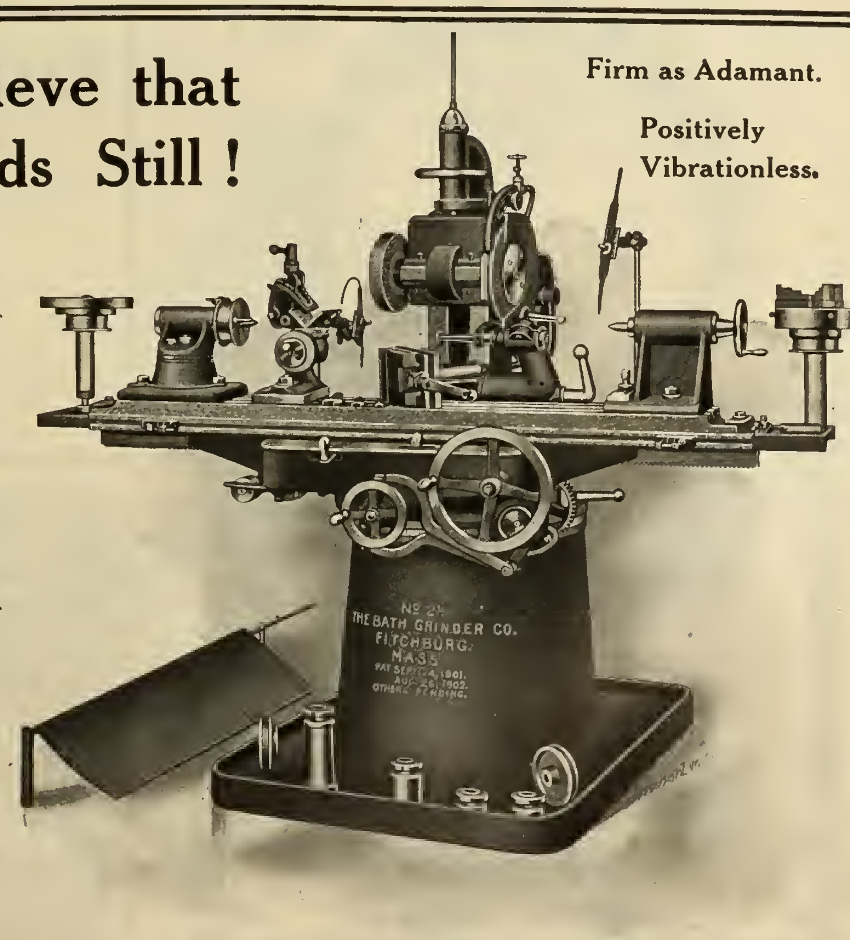

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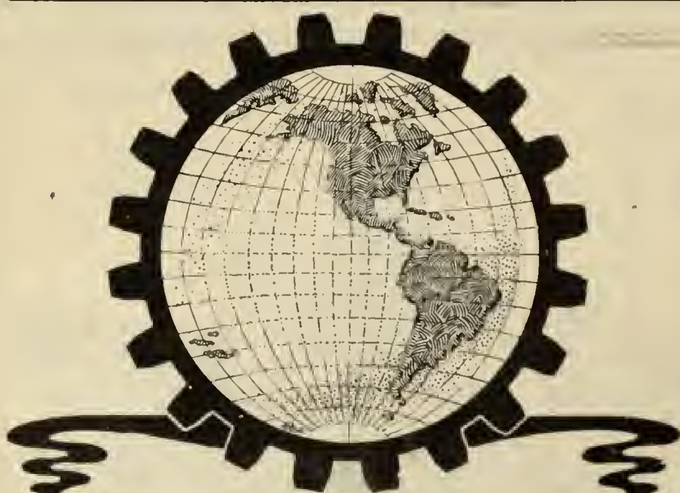

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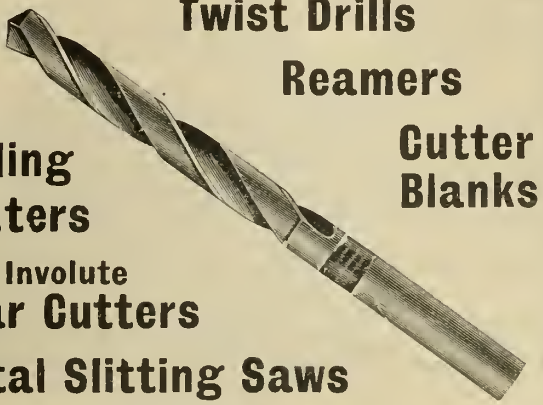

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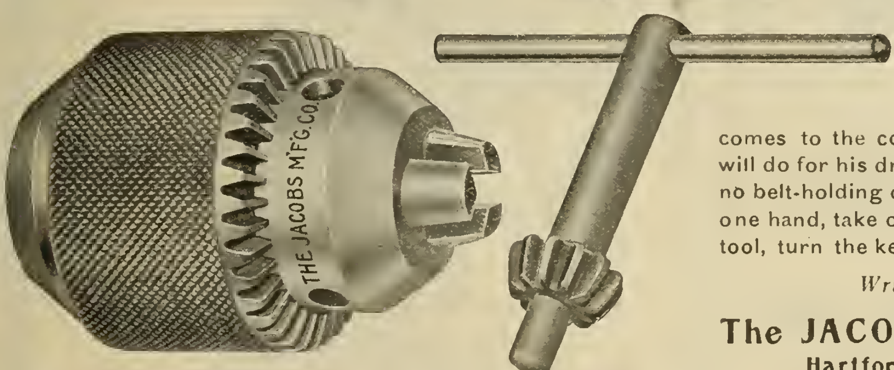

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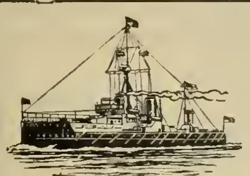

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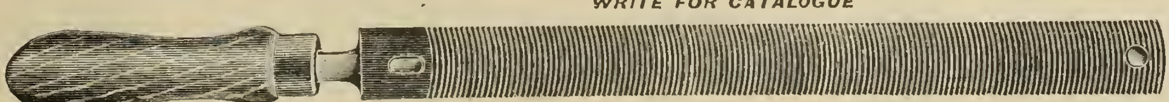

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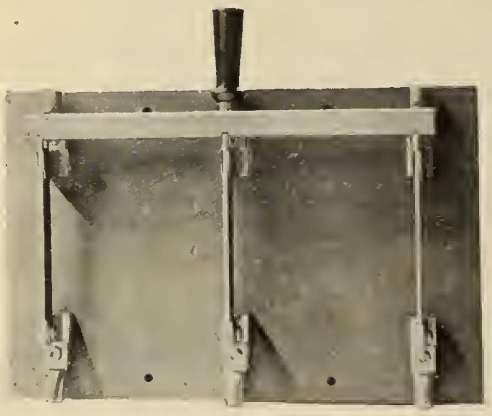

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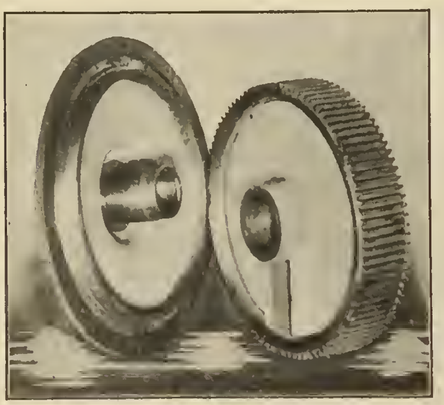

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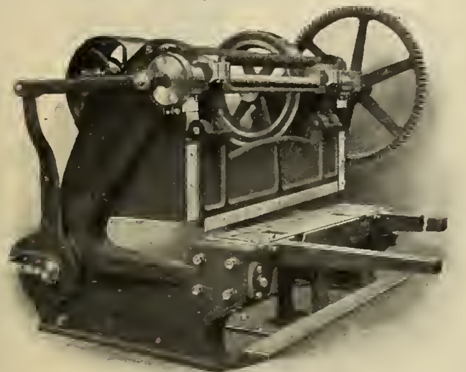

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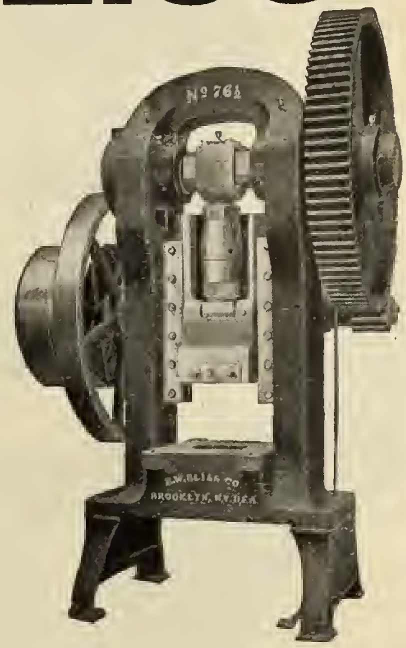

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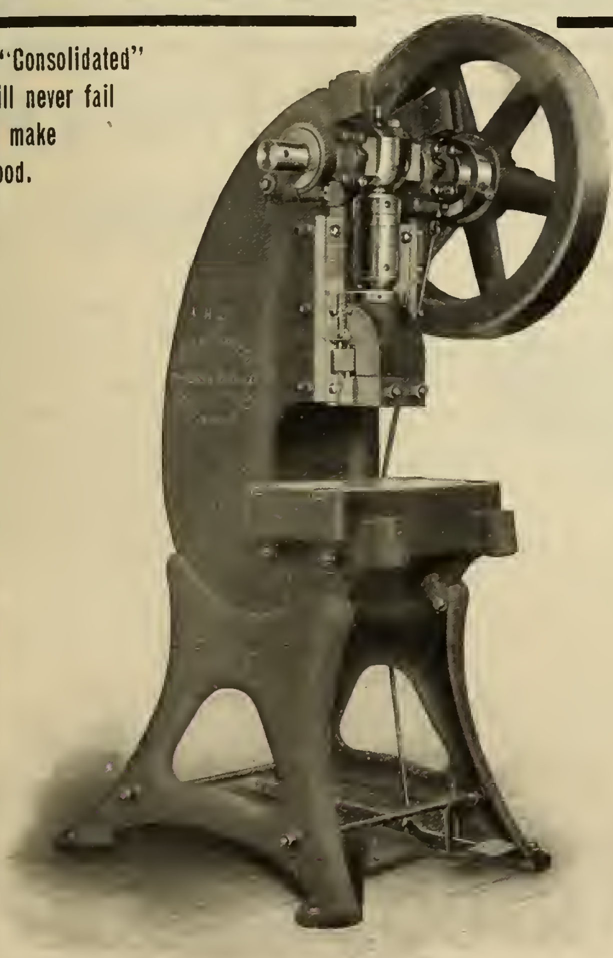

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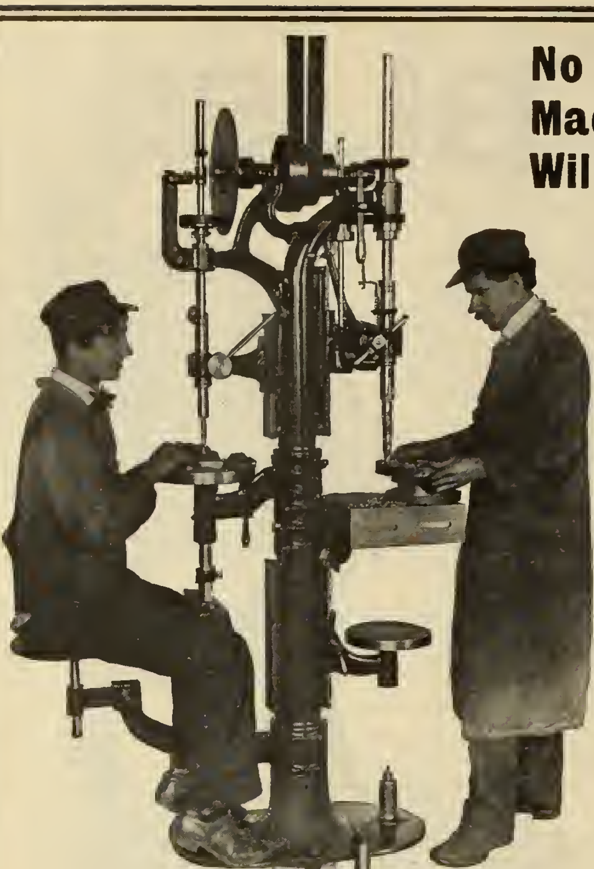

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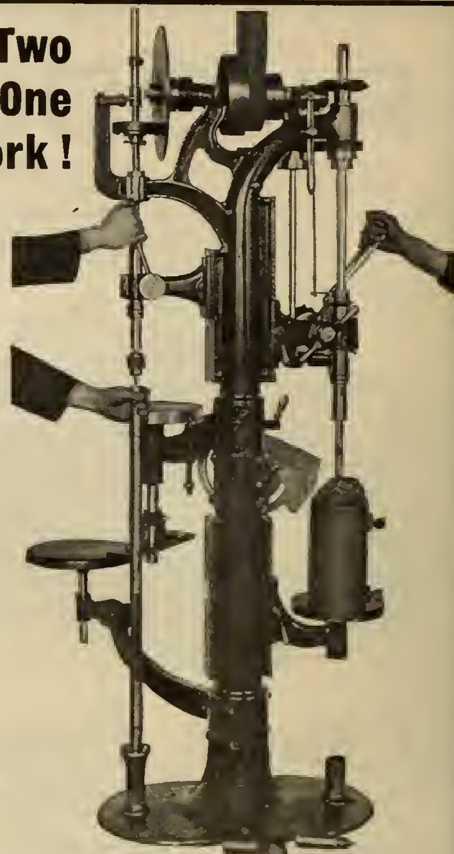

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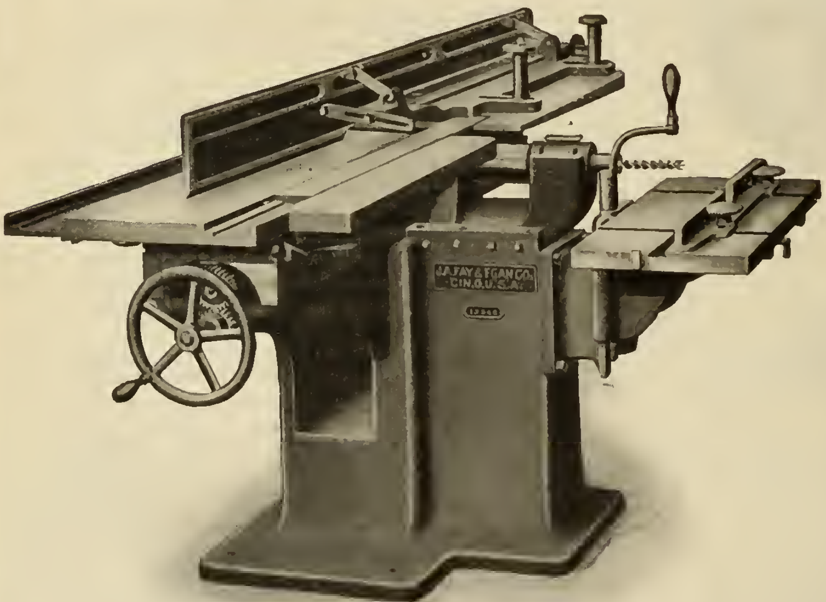

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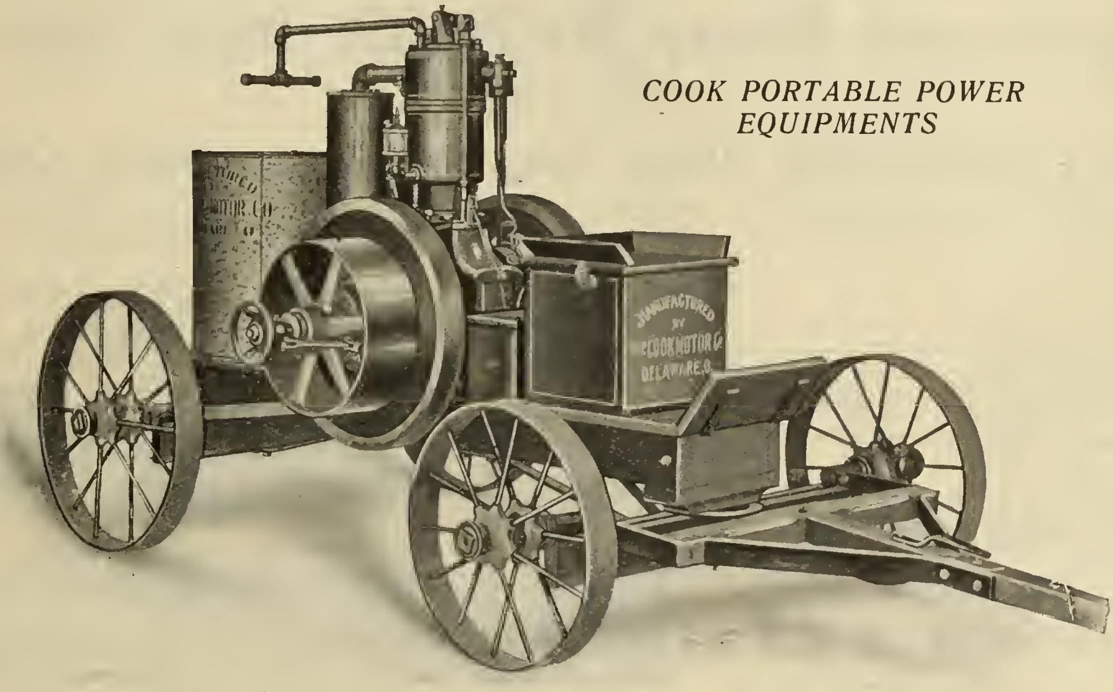

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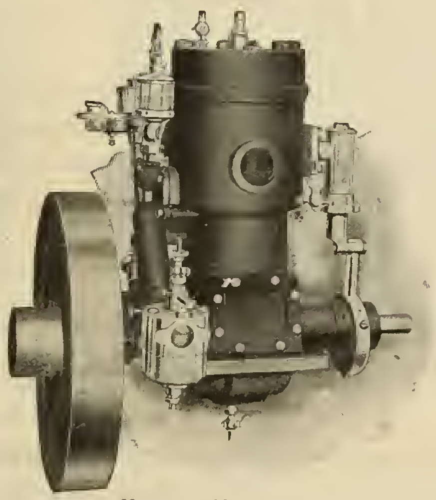

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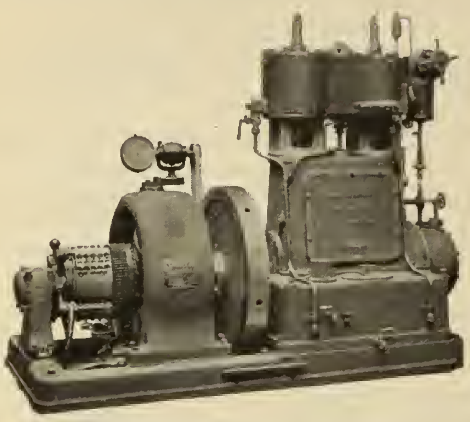

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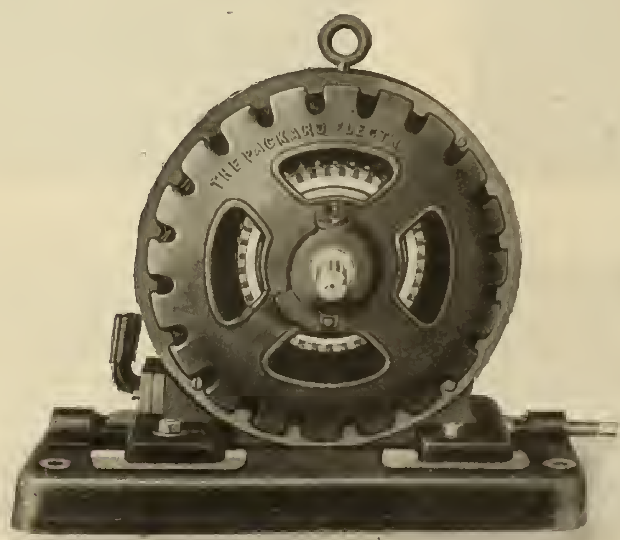

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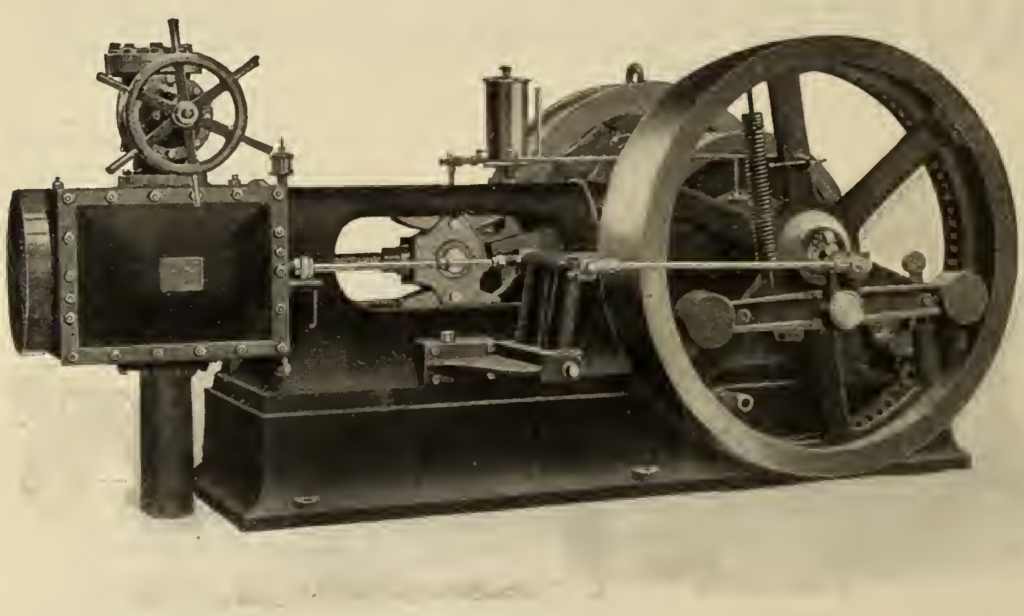

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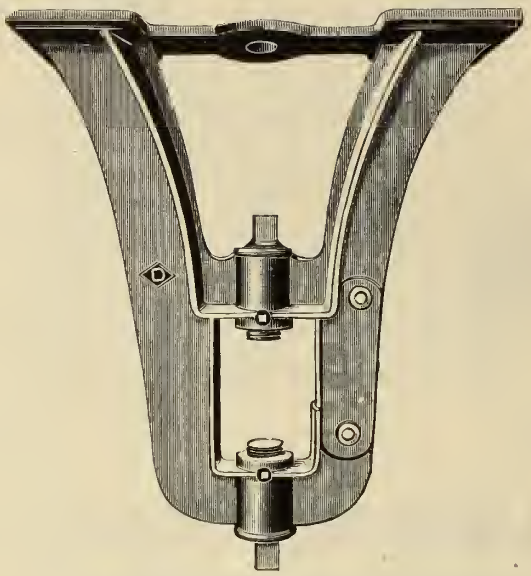

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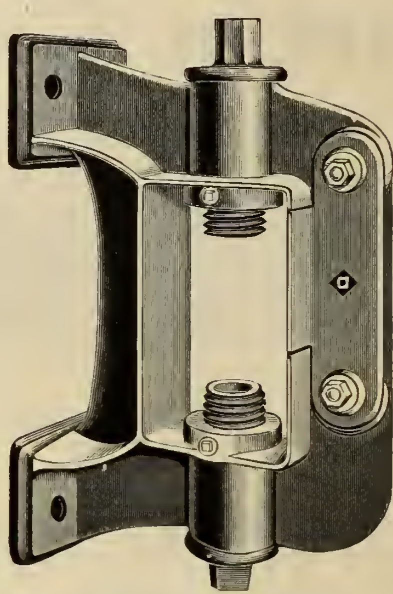

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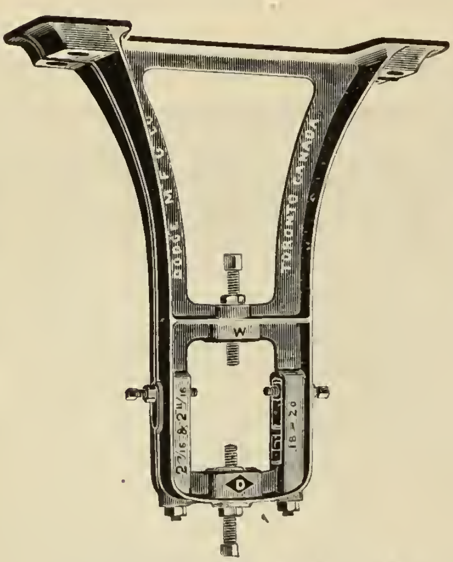

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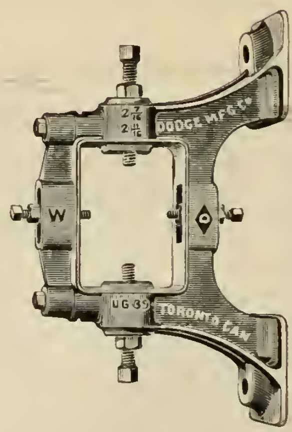

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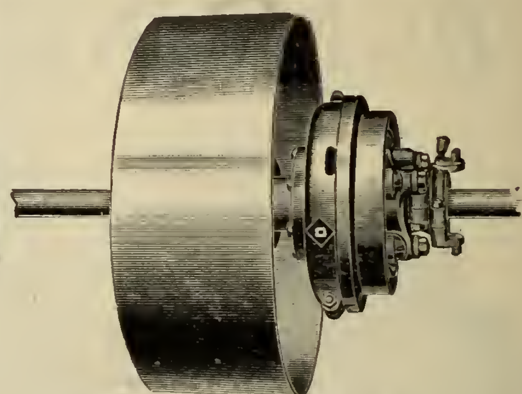

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The Early History of Machine Tool Firms in Canada*

Graphic Story of the Struggles of Machine Tool Builders in Canada in the Early Days, Showing the Development of this Canadian Industry.

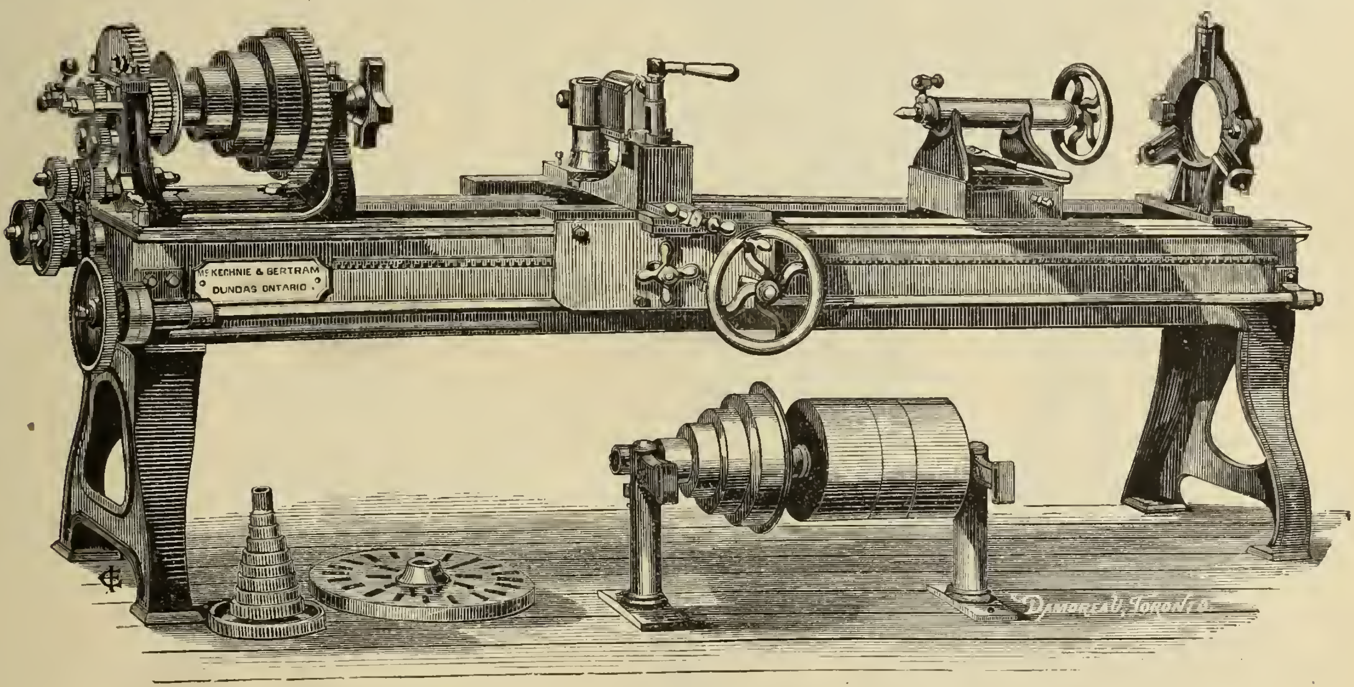
Years ago, when our forefathers were still building log cabins to live in, and when in many places the wheat, oats and timothy were still sown among the stumps, the first machine tool was made in Canada. This was half a century ago. In those days, as in the present, building tools and making money were not always synonymous. It was harder work then. The first machine tool built in Canada was not constructed on the ten hour a day schedule, but rather on the fourteen, fifteen, sixteen, seventeen and even eighteen hour schedule as the case might be. Methods were primitive and struggles severe.

The chief demand for machine tools at that time was from the railways, for the maintenance of their rolling stock. Most of the tools came from England, although some were brought in from the States. These English tools were heavy and substantial, with a great superfluity of metal, with no graceful lines, but withal very accurate and reliable. Some of these tools are still to be found in the railway shops. A few years ago when high speed steels were first introduced these tools gave such service as won for them the respect of all railway men. Their bulk and strength were no longer subjects for jest.

Dundas has the distinction of being the home of the machine tool industry. There it was the first machine tool was made in Canada, and the machine tool industry is now the backbone of the place. Dundas has seen the start and finish of more than one machine tool industry in embryo. While the first tool was made by W. A. Gibson in Dundas, Glenn of Oshawa also made one or two tools about the same time. The last thing heard of Glenn was his annexation articles written for the New York Sun. If he had thought more of machine tools and less of such unlikely things, his name might have been handed down as the originator of a large Canadian machine tool industry. W. A. Gibson did not persevere long at building tools, and was heard of last in Chicago.

Wm. Gibson was really in the machine tool business before McKechnie & Bertram. He built planers and lathes of the old American type with Rochester style beds—fluted and fancy. When McKechnie & Bertram manufactured lathes they made a better machine in form.

The real pioneers in the machine tool industry, or at least the ones who did most for it in the early days, were McKechnie & Bertram. It was started in Dundas in 1861 by R. McKechnie, the original firm being McDonald & McKechnie. A few years after this John Bertram became one of the firm. Both Mr. McKechnie and Mr. Bertram had worked in the Gartshore Foundry in Dundas, then the largest manufacturing plant in Canada. It is now a furniture factory. Mr. McKechnie was a patternmaker, while Mr. Bertram was connected with the iron department. Every person knowing anything of manufacturing in Canada knows of John Bertram, of John Bertram & Sons, and all who knew him well, loved and respected him. When he passed away his sons continued the work. Mr. McKechnie still lives in Dundas. He is now in the Customs Department. He retired from the manufacturing world many years ago, and is not so well known.



One of the First Lathes Made in Canada

Mr. McKechnie.

Mr. McKechnie is a Scotchman, born in Glasgow. He came to Canada at an age when he didn't know much about it. He served his time as a patternmaker in John Gartshore's foundry, and developed business ability as well. In fact he was the business man in the partnership of McKechnie & Bertram,

* In this history the data is accurate as far as we have been able to find out. In some cases of firms who are not now in business, records have been lost, so that much of the data in regard to them has been obtained from the old companies now carrying on business.—Editor.

which came later. Mr. McKechnie was at one time Vice-President of the Dominion Board of Trade, and for three years took an active interest in the Canadian Manufacturers' Association. He was also interested in promulgating the policy of protection of home industries, and he was active in the campaign for the system of protection which was eventually brought about by Sir John A. McDonald.

Mr. McKechnie thought he could build as good tools as anyone, and he started business. Though crude at first, they filled the wants of the country. They were cheap tools for agricultural work, and farm tools were roughly made then. The tools were built mostly by hand work. He built a good, serviceable Scotch type of lathe for the price. He was a good financier and a patternmaker and could make working drawings. Later other machinery, accurate and along fine lines was built.

He started a plant in Hamilton with the idea of establishing a locomotive works by making arrangements with the American locomotive builders, such as has been done in the case of the Montreal Locomotive and Machine Co. He hoped to get capital and experience from the States, but his health failed and he was obliged to retire for a time from active work. The building he had erected was sold to the Westinghouse interests and was turned into a plant for the manufacture of air brakes. This was the building occupied by the Westinghouse Co. previous to the organization of the Canadian Westinghouse Co.

John Bertram.

John Bertram was also a Scotchman, and learned his trade as a machinist in Scotland in his native place, Eddlestone, with his uncle, Thos. Amiers. After coming to Canada he worked in the Gartshore foundry for eight years before he went into partnership with Mr. McKechnie.

The struggles of the partnership in the early days were severe. The class of tool made in the early days would not sell now, but they were cheap and served the necessities of the times well enough. Outside the railroad shops most of the work required of machine tools was rough. These tools were, however, much better than those which had been previously made by Wm. Gibson. He built his tools on the American style, beds, the old Rochester type, fluted and beaded fancy beds. In 1886 McKechnie retired and John Bertram took into partnership his sons, Henry and Alexander, and later, James. Mr. Bertram always held a well-earned reputation as a generous, warm-hearted and honorable man.

Col. Alex. Bertram is Vice-President of the company; Henry Bertram, Sec'y-Treas., and James has charge of the pattern department. A joint stock company was formed in 1903 and two years later the capital stock was raised from $400,000 to $600,000. At the same time all the new buildings were erected. The payroll now numbers 425 employees.

Arrangements were made with the Niles-Bement-Pond Co. for the manufacture of their tools and use of their patterns, so that complete lines are now manufactured. In 1905 a branch of Pratt and Whitney was established in Dundas, but they confine themselves to small tools, so that they do not interfere with Bertram's.

In 1888 it was decided that woodworking and iron-working tools did not harmonize and attention was devoted to iron tools. After 1888 a complete line of all tools was started when before only one line was manufactured. Though now very general lines of tools are built, each line is by men who have specialized in that particular line. The business has grown from a small building erected on the site of the present office to the present spacious structures covering 67,000 square feet. This was not accomplished in a day, but as business grew, buildings, a little larger and of better construction were added until the large works of to-day were evolved.

All the brothers now interested were brought up in the business and now a third generation is being trained in the business. Orders to the Bertram Company date back to 1860 and among the first orders are:

Dec. 1, 1868—J. Fleury, Aurora, planer and screw-cutter.

Dec. 14, 1868—H. Harris & Son, Beamsville, shaper. This is Mr. Harris of Massey-Harris.

Feb. 17, 1869—Thompson & Williams, Mitchell, morticing machine. This is Mr. Williams of A. R. Williams Co., Toronto.

Mar. 6, 1869—John Fensom, Toronto, lathe. Mr. Fensom started the Fensom Elevator Co. On April 7 of the same year is an order for a second lathe.

May 6, 1869—Canada Screw Co., punch and shears, combined.

June 12, 1869—William Hamilton, Peterborough, lathe.

Among others who placed early orders and whose names are still familiar are Goldie & McCulloch, Galt, and John Abell, Woodbridge, of the Abell Engine Co. In April, 1870, the name of R. Gardner & Son, Montreal, appears, and in 1871, C. H. Waterous, Brantford; Northern Railway, Brockville and Ottawa Ry., Midland Ry., G.T.R., Noxon Bros., and hundreds of other orders from firms whose names are not now familiar and who have been replaced by the growing generations. This order book is a history in itself of the growth of Canada and the development of industrial enterprise.

The Bertrams have served a long apprenticeship and understand the business thoroughly. Alex. Bertram entered the company at the age of 13 and in his early apprenticeship had to fire the boiler, run the engine and blow a tin whistle at the noon hour. At that time, 1866, E. & C. Gurney supplied castings.

The Stevens Co., of Galt.

J. J. Stevens, R. M. Hamilton and John G. Stevens started making tools in Galt in 1886, confining their efforts to 16", 18" and 20" lathe, 20" drill and 16" shaper. It was called the Stevens-Hamilton Co. They added to their line later radial drills, milling machines and turret lathes. They equipped the Lozier Bicycle, now Canada Cycle & Motor Co. with turret and engine lathes. These are still being used and giving good satisfaction.

Mr. Robert McGregor was taken into partnership in the Fall of 189[illegible] and the firm was then changed to McGregor Stevens-Hamilton Co. In 1896 Mr. Stevens withdrew from the business.

In 1899 or 1900, J. J. Stevens, four years after withdrawing from the above company, interested R. McDougall Co., who were then only making pumps, in the subject of iron tool manufacture. Although Stevens was not a partner then, there was an arrangement beneficial to both parties. He rented a corner of the shop in which to make his vices.

McDougall Bros. bought out the novelty factory of A. J. Oliver, son-in-law of R. McDougall. R. McDougall is not now working, but the business is being carried on under the name, R. McDougall, Galt, by Thomas McDougall.

Mr. Stevens started his present business while at McDougall's and drew out formerly from R. McDougall's three or four years ago. He built a planer at McDougall's 44 feet long, making special surface plates, straight edges and other instruments for building it. The planer was practically built without machine tools, the greater part of the machine being planed in the machine itself.

Mr. Stevens recognized that true planing was the foundation of good tool work, as it is practically impossible to get work off a planer truer than the planer itself; so he set himself to work to devise tools and methods for the making of a planer, so that he would know to a certainty within what limits the planer was true.

The machine that he got up had a capacity of 60" wide, 48" high and planed work 21' long, weight was about 25 tons. The same had two heads on the crossrail, and two side heads.

The bulk of the planing on this machine was done on the machine itself.

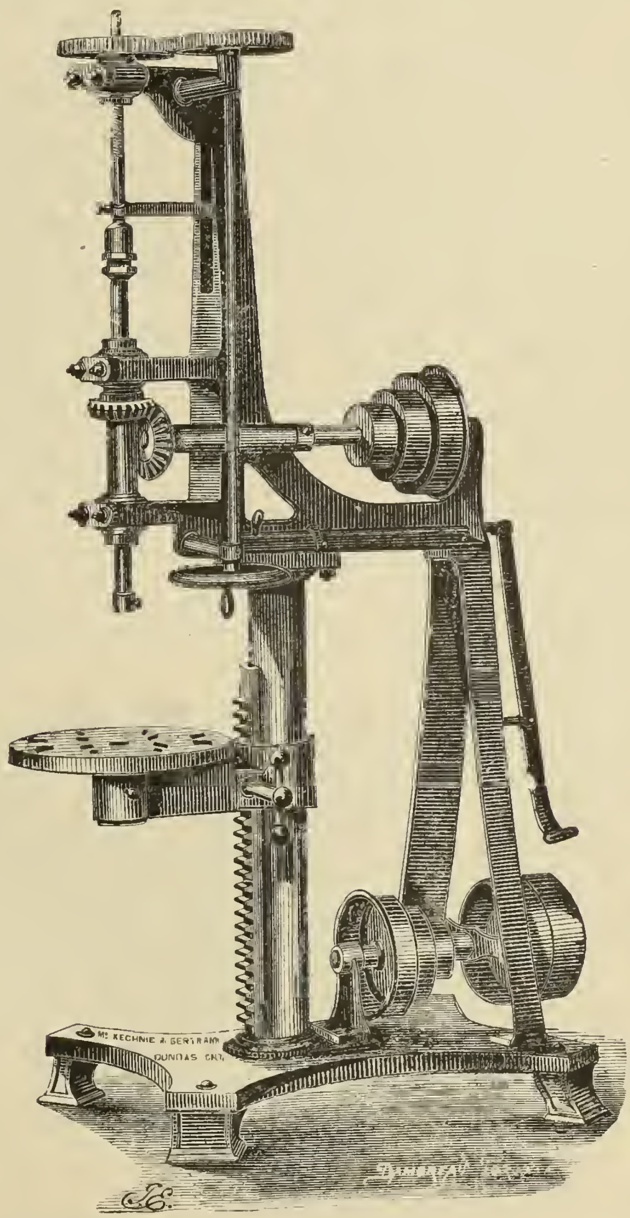
The bed was made up in five lengths, and the table in two lengths, all planed and scraped accurately and bolted together. The V's only of the middle section of the bed, which contained all the gearing, and on which the housings were fastened, and also the Vs only of one length of the table, were planed in another shop, on a Little and Maw planer which had seen considerable service, and the first thing that was done with these was to test them for accuracy, and they were found to be over 1-16" winding. The length of this middle section, and the one section of the table was each 12 ft. long. These were both corrected and to prove that the method pursued was one that would correct properly, it might be mentioned that when the Vs of the 12 ft. length of table were tried in the Vs of the 12 ft. section of bed they were found to fit perfectly, and no further rubbing and scraping needed to be done to them.

The next thing was to place this section of bed on the rock foundation which was prepared for it, in the position that it was going to be ultimately used, assemble the gearing and erect a temporary means of driving. The length of table that had the Vs planed and rack attached, was then set on the bed and made to travel back and forward, but as each were only 12 ft. long, only 8 ft. stroke could be given to the table.

Then by a special fixture fastened to the table, the sides of the bed were planed for the housings. The crossrail which was also planed in another shop, was fitted up with the heads, and attached in the usual position to wooden uprights, which acted as cheeks; these in turn were braced with long timbers running back some distance parallel with the planer. The cheek that goes on the working side of the planer was then planed and erected in place of the wooden cheek, and the permanent drive put on, then the other cheek was planed and erected. Then the Vs of the other four bed sections were planed one at the time, then they were turned round and the ends planed two at the time with the side-head on the working side of the machine and with the other cheek removed. As soon as these four bed sections were planed they were put in place and bolted to the working section, so as to get a 12 ft. travel of the table, when the other length of table was planed all over and fitted in place in the bed. Then the length of table that had been previously used with the top of it in the rough state as it had come from the foundry, was planed on the finished half length of the table, then it was also placed in the Vs of the bed and the joints between the two halves were planed by a tool working in the head crosswise with the table, by means of the cross screw which was temporarily operated by power. This, of course meant a perfect joint, as both table and ends were planed at once. When they were bolted together, the planer was practically finished.

To any mechanical critic the machine would appear to be built in one piece, so well are the joints made.

Stevens made the first patent vice in Canada. These were manufactured in the United States and sold on a royalty basis. Four years ago he started making engine lathes and universal tool cutter grinders and two years ago started building Jones & Lamson's type of flat turret lathe.



An Old Time Drill Press.

Little & Maw.

John Maw and Jas. Little started building machine tools as Little & Maw and later as the Dundas Tool Co. A planer built by them is still in use by Cowan & Co. It is driven by worm and rack, with worm set at right angles. Unfortunately, the depression of 1875-78 forced them to give up their business.

In 1864 John Maw started work. He remembered Mr. McKechnie who graduated from Bellington and Forsythe's agricultural implement works. McKechnie, John Bertram, Hector McKenzie, Mr. Little and old Mr. McKechnie used to do the painting.

At the time the oil excitement started, Little and Maw started to make pumping engines. The success of their pumps started them in the machine tool line. They built lathes, drills and wood planing, shaping and matching machines. The oil excitement started things going after a long depression. Good mechanics worked for $1.25 and $1.50 a day and thought they were doing well.

Mr. Little came from Philadelphia and had been working for Sellers. At that time American money was worth only 40 cents on the dollar. He was a genial, observing, unobtrusive, intelligent man, and like Mr. Bertram was ready to pick up ideas. They made what we would now call very poor tools.

Little & Maw built a 12-foot lathe to fill a demand for them. They required a planer to do the work and had to build one. It was planed in the Gartshore foundry and was accomplished in two operations. John Maw chipped the Vs in the first lathes. He chipped the Vs on the planer, and it was a good one. He used it for many years afterwards to build tools. Their first attempts (the oil pumps) were made in a little machine shop in Wardsville, near Bothwell. They bought their first lathe and drill from Bertram & McKechnie. They did not get along well there and returned to Dundas where they made machine tools and special machinery for a number of years with varying success. They then turned the firm into a joint stock company which was very unfortunate for them.

Then came hard times and there was no demand for machine tools. They had improved the design wonderfully by this time and manufactured a more modern machine tool, among them the Sellers worm planer, Fox lathe and Fitchburg shaper. As the Dundas Tool Co. they made all the tools for the I. C.R. when it was started. Mr. Maw says he would be in the business yet had it not been for the stock company. In 1886 and '87 woodworking machinery carried them through. Then both Mr. Maw and Mr. Little were left as bare as when they started.

After that plucky Mr. Maw started to make special machinery in Dundas with a tool chest, as Mr. Maw says. He finally met with some success and is now retired. Mr. Little is now engaged in the manufacture of waterwheels.

Mr. Maw designed machinery for making wire and sold some of his machines in the States, where he was retained for a time as mechanical expert. He then went in with the B. Greening Wire Co. and a joint stock company was formed. He was the mechanical man but his son has now assumed the responsibilities.

The Hamilton Tool Co. built a good line of tools, but they stopped making them and changed their name to the Hamilton Bridge & Tool Co.

The Bowmanville Machine Tool Co. was started in the early seventies by David Gibson, before the Fenian Raids. He had a small shop in Dundas for a time.

Another machine tool builder in the early seventies was E. Abbott, of Gananoque. He manufactured power hammers, Case engines, water wheels, bolt cutters, shapers, etc., and gave up business in 1891. The stock was purchased by Mr. Nolan, manager of the Canada Machinery Agency, Montreal. The machines were built in Gananoque but American patterns were used. At that time, 1891, great improvements were being made in machine tools and many of the machines Mr. Nolan purchased were unsalable and were relegated to the scrap heap.

Thos. Worswick built tools in Guelph. One of the first lathes installed in the Laurie Engine Works, Montreal, back in the seventies, was a Worswick. About that time Thompson & Williams were building tools in St. Mary's. The Great Western Railway line running from Niagara Falls to Toronto and Detroit built in Hamilton a lathe which they now use for turning rolls.

In Montreal the early concerns were taken up with ship building and engine manufacturing. W. H. Nolan opened up a supply store in 1882 with Captain William Gardner as partner. Before them R. H. Buchanan, who still carries on a machine tool trade in Montreal, started business.

Col. Robert Gardner, father of the present Col. Robert Gardner, was one of the first to build machine tools in Montreal, and the business has greatly developed under the present management.

A machine under the name of Millard was built in Montreal, but the history of this firm has been lost. Miller Bros. and Bartley & Gilbert were also old concerns who built a few machine tools but gave up most of their energies to the construction of engines.

The present Laurie Engine & Machine Co., who make a large line of presses, was founded by John Laurie in 1871. Mr. Laurie was quite reminiscent about the early days when he and his brother Walter, now Major Laurie, Consulting Engineer, built up the Laurie Engine Co. A small shop on Mary Street was bought and moved to Craig Street, where they worked for ten years. Then they moved into larger quarters at the corner of Wellington and Prince Streets. After seven years the flood drowned them out and while water covered the benches this aggressive firm looked around for a property without the zone of Spring floods. They obtained the old St. Andrew's Church property on St. Catherine Street and added piece by piece until when it was handed over to the present company in 1906 there was about 60,000 sq. ft.

One of the first new machines installed in their little factory on Craig Street, back in the seventies, was a Worswick lathe, made in Guelph. The present company, the Laurie Engine & Machine Co., is under the supervision of Mr. Yuile.

Thomas Pringle, Montreal, was one of the first millwrights in Canada and those were the days when there were mechanics, but "the old order changeth, yielding place to new," and in this age of specialization it becomes one man, one machine.

Then there was the old Eagle Foundry owned by Fred Brush, and Bartley & Dunbars, where John Laurie served his apprenticeship. This latter firm was afterwards joined by Mr. Gilbert. Wm. Irving, now of the St. John Street Railway, and John Laurie, served their apprenticeship together. Then Mr. Laurie was thirteen years with George Brush. Most of the tools used by Lauries as well as other Montreal firms were made by themselves.

The history would not be complete without a reference to the London Machine Tool Co., Hamilton, who are one of the old companies in the machine tool business. A history of the growth of this company will be given in one of our future issues.

R. HOBSON, HAMILTON.

Robert Hobson, Vice-President and General Manager of the Hamilton Steel & Iron Co., is the son of Robert Hobson, former chief engineer of the Great Western and Grand Trunk Railways and now consulting engineer of the latter company. When a young man he entered the employ of the Great Western Railway and remained with the company after it was absorbed by the Grand Trunk, until 1896, when he was appointed secretary-treasurer of the Hamilton Blast Furnace Company in February of that year. About a month later the company amalgamated with the Ontario Rolling Mills Company and on May 1, 1899, Mr. Hobson became secretary and assistant general manager of the company.

In the Spring of the year 1903, when C. S. Wilcox, then general manager, succeeded to the position of president of the company on the death of Senator A. T. Wood, Mr. Hobson was again promoted and became general manager of the company. Three years later he was honored with the appointment to the office of vice-president and general manager, the position which he occupies to-day.

He was elected President of the C.M. A. at its last annual meeting, a fitting testimonial to the appreciation of his services and the confidence of Canadian manufacturers in him.

The confidence of the public is a better asset in business than extra capital.

An Up-to-date Canadian Radiator Manufacturing Plant

The Similarity of Sections Which are Produced in Large Quantities Each Day in Shops Devoted to This Line Alone, has Resulted in Practice Involving Many Interesting Features of Core Making and Molding.

The first requisite of a foundry is its situation, and the facilities of the King Radiator Co., Toronto, for shipping are the best. Fig. 1 shows a general view of the St. Helens Avenue plant, which is situated on the G.T.R. in one of the best manufacturing districts of Toronto. On the right is the foundry, in the centre is the core room, and on the left is the shipping room where finished products are loaded directly on to cars for transportation.

This view gives an idea of the layout of the plant which is designed so that the radiators will pass from the foundry through the various departments to the shipping room progressively. Just as transportation is one of the important items to be considered in the location of a plant, so is it in the design of the plant. Trucks are being constructed to further facilitate the handling of work as it passes through the departments.

From the various illustrations an idea of the construction of the plant may be obtained. The frame work is of steel and the walls are of brick. The roof is the only part that is wooden and is constructed with 2x3 pine with tar and gravel covering. It is known as slow-burning mill construction.

Andrew & Johnston's hot blast heating system is installed throughout and the pipes carrying the hot air are shown in the illustrations.

A view of the foundry is shown in Fig. 2. The molds are made on molding machines made by the company, about 50 being in use. These are shown on the right of this illustration. The half patterns are mounted on a stationary table, both cope and drag being made on the same machine. The molds are rammed by hand and are lifted from the pattern by four flask bars operated by a hand lever in front. These machines are extremely simple in design and their low cost of production is one of the advantages that led to their adoption.

Practically all the radiator patterns used in this plant can be mounted on these machines, although a combination stripping plate and flask lifting machine is used for making wall radiator molds. Stools are provided on the latter for supporting the long green sand cores between the columns. The stools move upwards by the lifting bars, supporting the delicate cores until the mold is lifted from the machine

The Molding Machines.

The depth that the chaplets enter the patterns depends on the thickness of the casting, which is usually heavier at this point to allow of a flat surface being made on the core on which a small piece of tin is placed to prevent the chaplet from sinking into the core. It will be seen that when these chaplets are rammed up they are secured at the same time and require no further attention. The number of chaplets used in each mold varies with the number of columns and the length of the loop. The distance between these chaplets depends largely upon the strength of the core sand mixture used. As the force these chaplets are compelled to resist is the difference in weight between the core and the amount of metal it displaces, and as this is distributed among a large number, no great strain is placed on any one chaplet.

As radiator molding is carried on without the use of bottom boards, and to give the molds the desired incline to facilitate the running of the metal, two straight edges are imbedded in each floor throughout its entire length. Between these the molder prepares a level surface with another straight edge upon which he sets his drags, after which the cores are placed, the copes rammed and the molds are closed.

The general view of one section of the foundry is shown in Fig. 2. This department is 200x110 feet and is divided into three bays. The building is of steel and brick construction and is well lighted on four sides by double windows 8x10 feet. The foundry has an extreme height of 34 feet and ventilators extend the length of both sides of the monitor. A mashway in the centre of the shop extends its entire length,

Fig. 1.—General View of the King Radiator Company's Plant.

the molding machines being arranged along the sides of the building.

Melting Equipment.

The cupola shown in Fig. 3 is located in the middle bay at one end of the shop and taps into a skimming ladle from which the molders secure their iron. The cupola is a Colliau manufactured by Byron & Co., Detroit. It melts 12 tons per hour and uses 8½ to 9 tons iron to one of coke. The skimming device consists of an arch built of bricks across the diameter of the ladle, the metal passing through the opening underneath to the lip of the ladle. The cupola is lined to a diameter of 52 inches and blast is furnished by a Connersville blower driven by a 20 horsepower motor. This set is mounted on an elevated enclosed platform. The charging floor is 32x40 feet and is provided with a scale at the elevator opening on which the charges are weighed before being dumped into the cupola or piled for future use. The capacity is 2,000 loops daily.

Fig. 2.--Foundry.

Fig. 4.—Core Room.

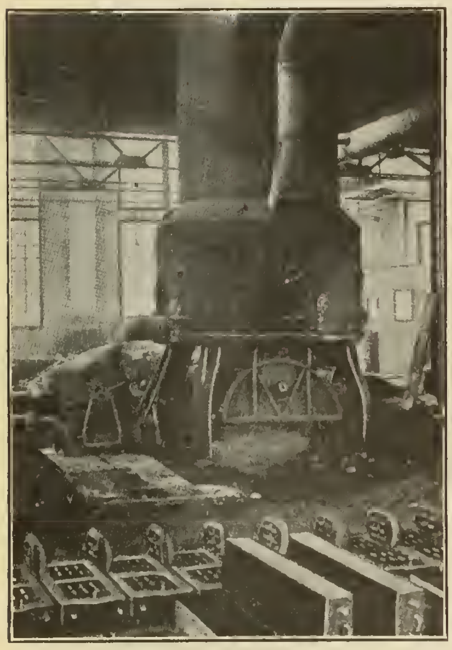


Fig. 3.—The Cupola.

Core Room.

The core room of this plant is shown in Fig. 4. It is 50x100 feet and is well equipped for the economical production of difficult radiator cores. The four stationary ovens, built after their own design, are coke fired from the rear, each oven being 8x9 feet and 7 feet in height. A transfer track shown in Fig. 4 is used instead of a turntable, and extends almost the length of the shop. This permits the core racks to be unloaded where the cores are stored for future use and the racks can also be conveyed to the coremakers' benches when empty. Each oven will hold one rack, with a capacity of 180 cores.

The sand is delivered into a pit located at one end of the shop and is elevated to a mixer on a raised platform by bucket conveyors. The mixer and conveyor was installed by the Standard Sand & Machine Co., Cleveland. When the sand is prepared it is wheeled along a platform above the coremakers' benches and delivered to them through holes in the floor of the platform, no time being lost by the coremaker while the sand is supplied to him.

Making Radiator Cores.

The making of radiator cores involves problems not frequently encountered by the average coremaker. The pasting of cores is obsolete practice in radiator plants, and vents are not made with wires. In Fig. 5, 1 shows the core box of a four column core. A core pan similarly constructed, in which the core is dried, is used in making the other half. After the sand has been packed in the core box and the pan, the vent plate 2 is used. The vents lead to one point and a corresponding vent is made in the mold to permit of the escape of the gases through one opening. After the vent plate has been applied to both halves of the core, the core box 1 is closed over the half core in the pan, rapped and lifted off. This operation finishes the core, which is set on a rack in the pan. As the cores are made entirely without rods or wires, a sand mixture must be used that will permit them to readily leave the castings. As

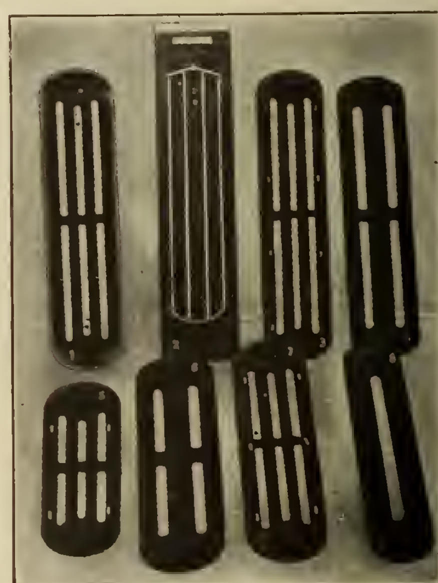


Fig. 5.—Core Box, Vent Plate and Various Cores.

the metal very nearly covers the core the reason for striving in this direction is apparent. A good, sharp sand is generally used, mixed with linseed oil and resin. In Fig. 5—3, 4, 5, 6, 7 and 8 show a variety of radiator cores. These are made to withstand rough handling in both the core room and the foundry.

The Cleaning Room.

The castings are brought from the foundry to the cleaning room where they are placed in tumbling mills and ground. This room is 45x50 feet and is equipped with five tumbling mills installed by the Whiting Foundry Equipment Co., Harvey, Ill. The mills are driven by a 20 horse-power motor.

Testing Department.

The next step in progress of the work through the departments is the first testing operation. The testing and assembling shop is 250x107 feet. The sections which are only 5-32 of an inch thick, are subjected to a hydrstatic test of 120 lbs. per square inch.

They are then tapped on the tapping and facing machine shown in Fig. 6. Two of these machines have been erected and another is under construction. It taps and faces four openings in a radiator section in one operation. It is adjustable for radiators of various lengths and widths. The angle sections for bay windows are machined on a boring mill.

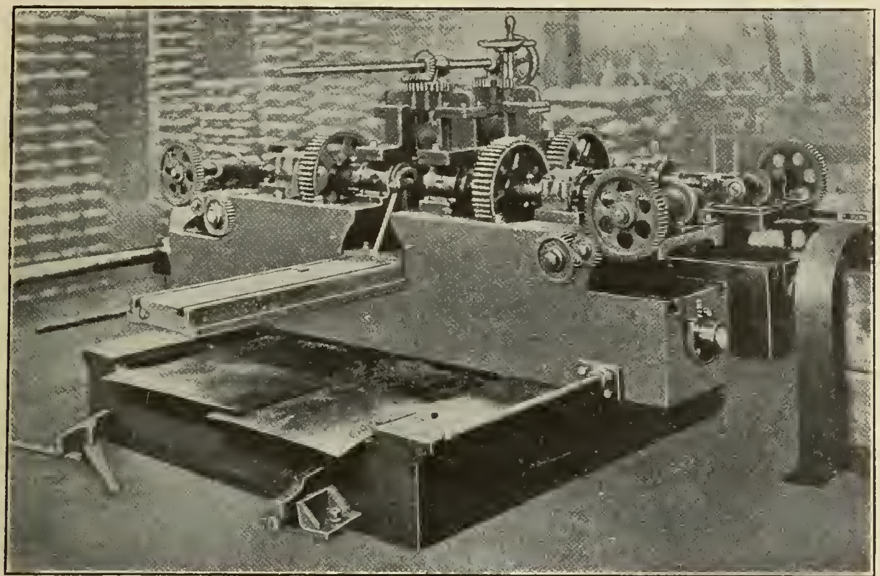


Fig. 6.—Radiator Tapping and Facing Machine.

An assembling machine is used for fitting the loops together. Before the loops are tapped and faced they are subjected to a hydrstatic test singly and if found imperfect they are consigned to the scrap pile. After assembling they are subjected to a second test before shipping. Fig. 7 is a view of the shipping room. This view gives a good idea of the construction of the building.

Fig. 7.—Erecting and Shipping Room.

Fig. 8 shows the well equipped machine shop located in one corner of the building. Here the metal patterns are finished and mounted on the molding machines and the cast iron flasks, which are used exclusively, are fitted and faced. The flasks are simple in design, being made without bars. All the tools and equipment are electrically driven by motors, the system of group driving being used. The power is brought from Niagara at 22,000 volts and transformed down to 550.

Fig. 8.—Machine Department.

R. J. Cluff is the capable manager of the King Radiator Co., Ltd., and J. C. Harley, formerly of the American Radiator Co., is superintendent.

INDUSTRIAL COURSE IN FITCHBURG.

By G. H. Dyer. *

The Fitchburg Iron Workers' Association recently tendered a banquet to the members of the Fitchburg City Government and School Board, and laid before them the plans for an industrial school to be incorporated in the present High School system, which was readily taken up by the City Government, and has been put into operation.

The idea is somewhat unique, and bids fair to become an essential factor in industrial education in towns and cities of limited size throughout the country.

The plan, as outlined, is in the form of an apprenticeship system whereby boys having passed the first year in High School take up the next three years a mechanical course, studying one week in the school and the following week working in the shops. A special instructor has been employed, and special text books provided. The boys are taken in pairs by the manufacturing companies, and the boy who has studied in school a week on Saturday morning

*Secretary and Treasurer of Fitchburg Machine Works, Fitchburg, Mass.

at 11 o'clock goes to the shop and learns on what particular job the boy has been working, and how it is handled so that he can come in the following Monday morning and begin work where the other boy left off, thus following the shop course without necessitating instruction on the part of the shop foreman.

Mr. Hunter, the man in charge of this work, has had more applications than could be taken care of the first year, and at the present time all the boys are working in the shops and will continue to do so until the school opens.

The school course is as follows; first year, all school work:

	Periods per week.
English	4
Shop mathematics	5
Mechanics	5
Freehand and mechanical drawing	5
Current events	2

Second year, school and shop work:

	Periods per week.
English	4
Shop mathematics	5
Chemistry	4
Electricity and heat	4
Freehand and mechanical drawing	8

Third year, school and shop work:

	Periods per week.
English	4
Shop mathematics	4
Com. Geog., business methods and conditions	4
Advanced chemistry or industrial history	5
Freehand and mechanical drawing	8

Fourth year, school and shop work:

	Periods per week.
English	4
Civics and Am. history	5
Applied mathematics	5
Mechanical and Freehand drawing	8
Discussion of current mechanical appliances	2

Shop work consists of instruction in the operation of lathes, planers, drilling machines, bench and floor work, and such other machine work according to the ability of the apprentice as pertaining to the particular branch of manufacture in the shop where he is employed.

Copy of the rules and conditions of this system is given below.

Rules and Conditions.

Under which special apprentices taking the four-year co-operative industrial course at the High School of Fitchburg are received for instructions at the works of

....

1st. The applicant for apprenticeship under this agreement must have satisfactorily met requirements for entrance to this course at the High School.

2nd. The apprentice is to work for us continually, well and faithfully, under such rules and regulations as may prevail at the works of the above company, for the term of approximately 4,950 hours, commencing with the acceptance of this agreement, in such capacity and on such work as specified below:

Lathe work, planer work, drilling, bench and floor work, and such other machine work, according to the capacity of the apprentice, as pertains to our branch of manufacturing.

This arrangement of work to be binding unless changed by mutual agreement of all parties to this contract.

3rd. The apprentice shall report to his employer for work every alternate week when the High School is in session, and on all working days when the High School is not in session, except during vacation periods provided below, and he shall be paid only for actual time at such work.

4th. The apprentice is to have a vacation, without pay, of two weeks each year, during school vacation.

5th. The employer reserves the right to suspend regular work wholly, or in part, at any time it may be deemed necessary, and agrees to provide under ordinary conditions other work at the regular rate of pay, for the apprentice during such period.

6th. Should the conduct or work of the apprentice not be satisfactory to employer, he may be dismissed at any time without previous notice. The first two months of the apprentice's shop work are considered a trial time.

7th. Lost time shall be made up before the expiration of each year, at the rate of wages paid during said year, and no year of service shall commence till after all lost time by the apprentice in the preceding year shall have been fully made up.

8th. The apprentice must purchase from time to time such tools as may be required for doing rapid and accurate work.

9th. The said term of approximately 4,950 hours (three-year shop term) shall be divided into three periods as stated below, and the compensation shall be as follows, payable on regular pay days to each apprentice.

For the first period of approximately 1,650 hours, 10 cents per hour.

For the second period of approximately 1,650 hours, 11 cents per hour.

For the third period of approximately 1,650 hours, 12½ cents per hour.

10th. The above wage scale shall begin the first day of July preceding the apprentice's entrance upon the first year of shop work of the High School Industrial Course.

The satisfactory fulfilment of the conditions of this contract leads to a diploma, to be conferred upon the apprentice by the School Board of Fitchburg upon his graduation, which diploma shall bear the signature of an officer of the company with which he served his apprenticeship.

Hackett's New Drill Made From Flat Bar.

NOVEL TWIST DRILL.

A drill made from flat bar stock throughout its entire length has been placed on the market and overcomes the problem of broken tangs. The shank end is closely twisted, making a strong tang and gives sufficient bearing to hold well in a regular socket without the use of special chucks or collets. The drill is driven into the socket in the same way as is done with a drill of the usual construction.

The drill is light and easy to handle. The small amount of stock necessary makes them economical to manufacture. They are sold by Hackett High-Speed Drill Co., 90 West St., New York City.

The field for ingenuity and originality is as great in one line of business as in another Doing "something different" is the keynote to business advancement.

Automatic Machine Shop Time and Cost Keeping System

Ten Years' Experience of an Expert on Effective Cost Systems—Application of Rochester Time Recorder, with Practical Illustrations.

By C. M. PENFIELD *

As every manufacturer is interested in the sale of goods at a profit, it follows that he should be interested in factory cost keeping, because the amount of profit cannot be accurately determined unless the actual cost of production is known. The active competition of the present period renders it absolutely necessary for the manufacturer to know accurately the cost of his product.

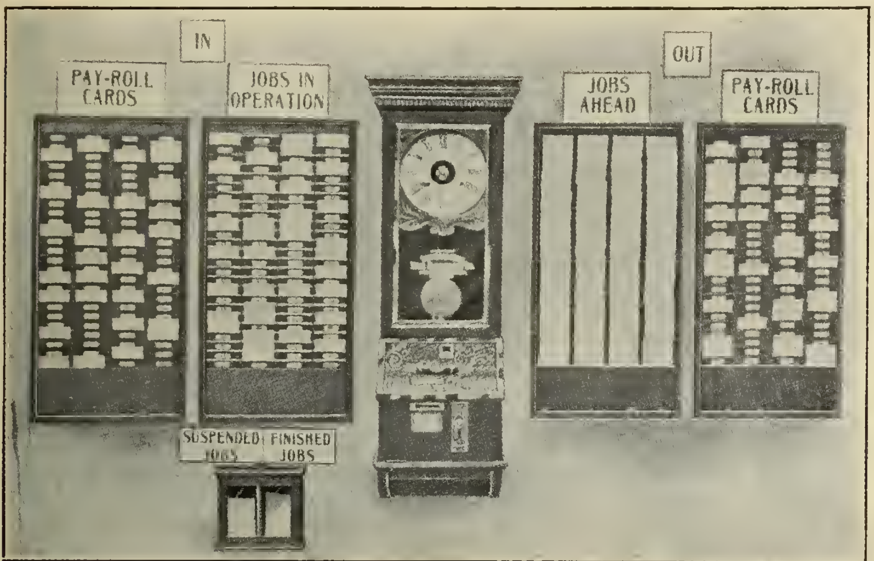


Fig. 1.—International Rochester Card Labor Cost Recorder.

The principal items which contribute to the costs of a factory are labor, material, manufacturing supplies, special items of cost and general expense. Of these, labor is probably the most important, most difficult to keep accurate account of, and most often neglected.

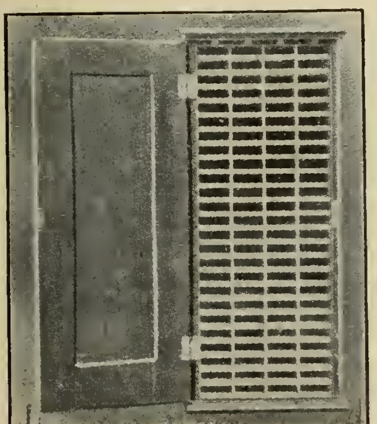


Fig. 2.—Foreman's Filing Cabinet.

Examine any of the many more or less elaborate cost systems and it is found in almost every case the distribution of time on jobs is made by each workman, in pencil, on his own time card. This seems to be universal practice and has proved by long experience to be the most satisfactory way of obtaining workman's time on jobs. It is necessary to be certain of securing accurate distribution of time, and with this in view the following automatic cost system has been designed.

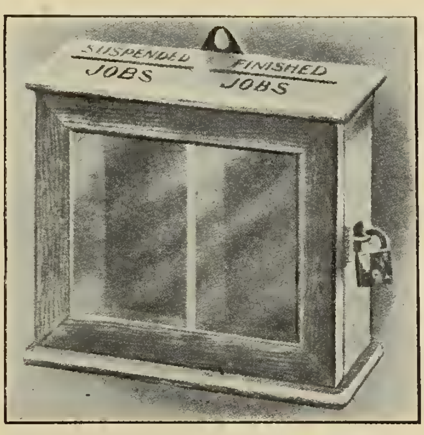
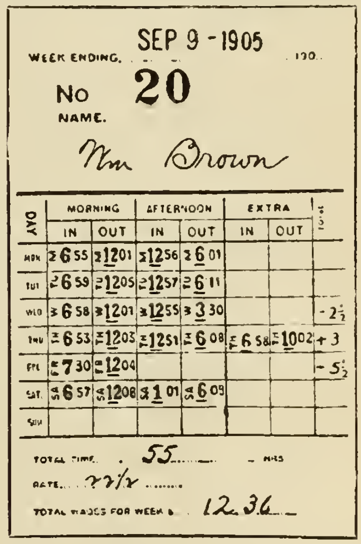


Fig. 3.—Finished and Suspended Job Work.

Figure 1 shows the departmental outfit necessary. It should be located near the foreman's office or desk, which is usually at a central point in the room, or on the floor of which he is in charge. The two card racks at the extreme right and left of the recorder are for time or payroll cards. The rack between the recorder and the "in" rack is for "jobs in operation." The one between the recorder and the "out" rack is for "jobs ahead." By "in" and "out" is meant when the workmen are in the works at work and out of the works off duty.



WEEK ENDING SEP 9 - 1905 190..

No 20

NAME. Wm Brown

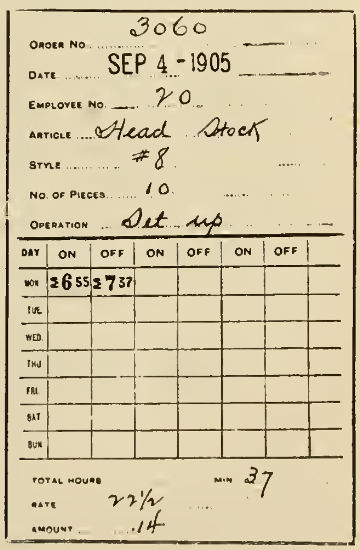
DAY	MORNING IN	MORNING OUT	AFTERNOON IN	AFTERNOON OUT	EXTRA IN	EXTRA OUT	TOTAL
MON	6 55	12 01	12 56	6 01			
TUE	6 59	12 05	12 57	6 11			
WED	6 58	12 01	12 55	3 30			- 2½
THU	6 53	12 03	12 51	6 08	6 58	10 02	+ 3
FRI	7 30	12 04					- 5½
SAT.	6 57	12 08	1 01	6 09			
SUN							

TOTAL TIME 55 HRS

RATE 22½

TOTAL WAGES FOR WEEK $ 12.36

Fig. 4.—Weekly Time Pay Card.



ORDER NO. 3060

DATE SEP 4 - 1905

EMPLOYEE NO. 20

ARTICLE Head Stock

STYLE #8

NO. OF PIECES 10

OPERATION Set up

DAY	ON	OFF	ON	OFF	ON	OFF
MON	6 55	7 37				
TUE						
WED						
THU						
FRI						
SAT						
SUN						

TOTAL HOURS MIN 37

RATE 22½

AMOUNT .14

Fig. 5.—Job Ticket Card.

* Address: International Time Recording Company, Binghampton, N.Y.

Another thing necessary in the departmental outfit is the filing cabinet shown in Fig. 2. This is to be located upon

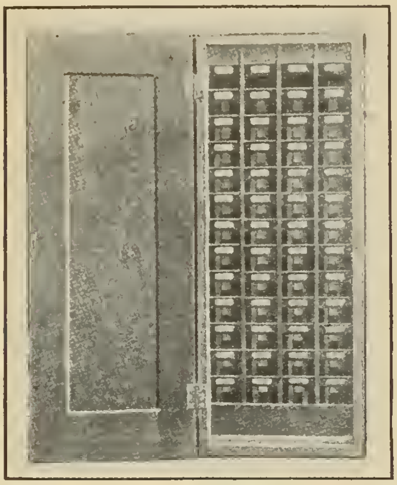


Fig. 6.—Job Ticket File Cabinet.

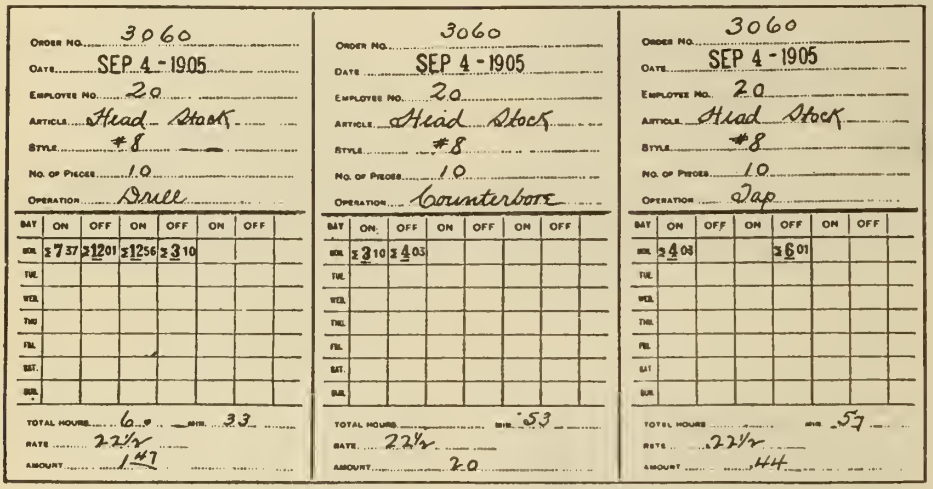
or very near the foreman's desk, and is to be used for job tickets made out ahead for certain work on specified jobs in the chain of automatic cost keeping.

Last, but not the least important thing in the departmental outfit is the foreman's friend, the job ticket box. (See figure 3.) This is to be located near the recorder, preferably where it can be seen from the foreman's desk.

As a practical illustration of the plan pursued each day in each department and in connection with each employee, take as an example a workman whose name is Brown, with 20 as his number.

Brown enters the department on Monday morning at 6.55 and finds in his pocket in the "out" rack two cards, his weekly time card and his job ticket, shown in Figs. 1 and 5.

He records his time of arrival on both tickets, then places the weekly time card in the "in" rack where it remains until he goes out for lunch at noon. To suppose a case, Brown is not familiar with the work specified on his job ticket. He comes to his foreman, asking for an explanation respecting this particular job. Here is one way in which this system is a great help to the foreman. He does not have to keep in



Order No. 3060
Date SEP 4 - 1905
Employee No. 20
Article Head Stock
Style #8
No. of Pieces 10
Operation Drill

Day	On	Off	On	Off	On	Off
Mon.	7 37	12 01	12 56	3 10		
Tue.						
Wed.						
Thu.						
Fri.						
Sat.						
Sun.						

Total Hours 6 Min. 33
Rate 22½
Amount 1 47

Order No. 3060
Date SEP 4 - 1905
Employee No. 20
Article Head Stock
Style #8
No. of Pieces 10
Operation Counterbore

Day	On	Off	On	Off	On	Off
Mon.	3 10	4 03				
Tue.						
Wed.						
Thu.						
Fri.						
Sat.						
Sun.						

Total Hours Min. 53
Rate 22½
Amount 20

Order No. 3060
Date SEP 4 - 1905
Employee No. 20
Article Head Stock
Style #8
No. of Pieces 10
Operation Tap

Day	On	Off	On	Off	On	Off
Mon.	4 03			6 01		
Tue.						
Wed.						
Thu.						
Fri.						
Sat.						
Sun.						

Total Hours Min. 57
Rate 22½
Amount 44

Fig. 7.—Finished Job Tickets.

that are coming along later. These job tickets are accumulated in this filing cabinet, as many of them as possible to assign ahead for each workman, and provides a supply from which the foreman may draw upon to fill the empty pockets in the job ahead rack as fast as they are emptied from hour to hour. This filing cabinet is an important link

Article Head Stock
Style #8

Date		Order No.	No. of Pieces	Emp. No.	Rate	Operation	Time Hrs.	Time Min.	Cost	
9	4	3060	10	20	22½	Set up		37		14
						Drill	6	33	1	47
						Counterbore		53		20
						Tap	1	57		44
									2	25

Fig. 8.—Summary of Job Tickets.

mind the work Brown is to do in the morning. It is thought out the night before and a job ticket made for the work and placed in his pocket in the "out" rack where Brown finds it in the morning on entering. Consequently he comes to his foreman to remind him that he has to do that job instead of the foreman having to watch for him and remind him of the work to be done. Having secured the desired information, Brown places his job ticket in the jobs in the operation rack and proceeds with the work specified on that ticket.

If Brown is a drill-press hand the first operation is setting up or making ready the job specified on the job ticket mentioned. He completes this operation at 7.37 and goes immediately to the recorder and rings "out" on the ticket for setting up. After ringing this ticket "out" he drops it into the job ticket box through the slot marked "finished jobs." He then takes his ticket from the "job ahead" rack and rings it "in" at 7.37. This new job ticket is for the drilling operation, which he begins at 7.37. It is not necessary for Brown to

Rate 22½

	Hours	Min.		Hours	Min.		Hours	Min.		Hours	Min.
1	23		16	3 60		31	6 98	12	46	10 35	
2	45	01	17	3 83		32	7 20		47	10 58	18
3	68		18	4 05	07	33	7 43		48	10 80	
4	90	02	19	4 28		34	7 65	13	49	11 03	
5	1 13		20	4 50	08	35	7 88		50	11 25	19
6	1 35		21	4 73		36	8 10	14	51	11 48	
7	1 58	03	22	4 95		37	8 33		52	11 70	20
8	1 80		23	5 18	09	38	8 55		53	11 93	
9	2 03		24	5 40		39	8 78	15	54	12 15	
10	2 25	04	25	5 63		40	9 00		55	12 38	21
11	2 48		26	5 85	10	41	9 23		56	12 60	
12	2 70	05	27	6 08		42	9 45	16	57	12 83	
13	2 93		28	6 30	11	43	9 68		58	13 05	22
14	3 15		29	6 53		44	9 90	17	59	13 28	
15	3 38	06	30	6 75		45	10 13		60	13 50	23

Fig. 9.—Computing Table for Job Work.

see the foreman after setting up his work; his job ticket, which the foreman had placed in his "job ahead" rack before he was ready to start it, gave him the information that he was to proceed with the drilling operation.

Suppose the foreman is not at his desk when Brown changed his job tickets, the work will proceed without further trouble to the foreman. When the foreman returns he finds that the job ticket box, which is fitted with a glass door, contains a ticket. Upon removing the ticket the foreman sees that Brown's ticket for setting up finished at 7.37. Every time there is a ticket in the job ticket box there is an empty pocket in the "job ahead" rack. In this case Brown has removed his drilling card and left his pocket empty. To fill it a card is taken from the filing cabinet. In it is a ticket for the counterboring operation (which the foreman had previously made out and placed there). The foreman places this ticket in the "job ahead" rack and at 3.10, when he finishes drilling he goes through the same procedure as before, and he does so each time he changes his job or

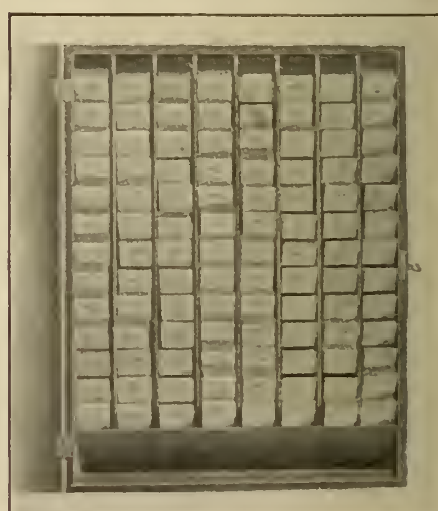


Fig. 10. Finished Jobs Filed in Cost Office.

perhaps as in this case, whenever he changes the operations on the same job.

Should it be necessary to suspend operation on a job, the workman rings "out" on his ticket and drops it into the suspended job slot in the job ticket box.

The foreman, upon removing it, can replace it again in the "job ahead" rack for the same workman, or can transfer the job to another employee, in which case he would fill out a duplicate ticket, bearing the succeeding employee's number, and file the original in the finished job rack at his desk.

Every finished ticket as it is removed from the job ticket box is placed in the finished job rack at the foreman's desk. They are filed by workman's numbers consecutively (a pocket for each number) and remain in this rack until the following morning when the clerk of the cost department comes to collect the job tickets finished the previous day. By comparing the job tickets with the payroll cards he proves that every minute of the time for which the men are paid is accounted for and properly distributed on the job tickets. Should he find a discrepancy of time between the "out" record on one job ticket and the "in" record on the next card, it would prove that the foreman had neglected to provide that employee with work ahead, and that the employee had to wait the number of minutes in the discrepancy for the foreman to give him the next job. Thus by systematically planning the work ahead for his men a foreman can greatly increase the output of his department.

After making this comparison between the job tickets and the time cards, the finished job tickets are taken to the cost department where the time and amounts are extended and tickets filed each day in a job ticket file. (See figure 6.)

This file provides for the accumulation in separate pockets of the finished job tickets applying on the various working orders in the works. As fast as orders are finished, the job tickets applying on them are removed from this job ticket file and the data thereon transferred to cards or books for future reference. For example, take the work of this man Brown on the work described herein (see figure 7, a, b and c). This data might be summarized on a card as shown in Fig. 8.

It will be noted that the time on these job tickets is recorded down to a single minute, and that one minute is the minimum unit of time used for computing cost, instead of fifteen or thirty minutes as is the usual custom. In Fig. 9 is shown a form of computing table to be used in computing costs, using one minute as the minimum unit, and using for example the rate of 22½c per hour. This shows you at a glance the value of 23 hours 43 minutes at this rate to be $5.34.

By the use of a set of these computing cards, it is possible to extend the amounts on from 300 to 400 job tickets an hour.

A workman need not necessarily be able to read and write to properly record his time on jobs by this system.

For taking care of the charges of material it is necessary to have material forms on cards of the same size as the labor cards for convenience for filing. In many places a double card is used, one half being the material requisition and the other half the job ticket. These may be numbered in duplicate.

In using this system, different colored cards may be used to good advantage to denote different departments, or different kinds of work, or to distinguish day work from piece work.

DEVELOPMENT.

Everything in this world is a development. Nothing happens by chance.

Everything and every idea is possible only because other things and other ideas have preceded it.

We look at a modern steam-engine and it seems very simple. The engine of fifty years ago was a little more complex and slightly more crude. We wonder why just as simple and just as good an engine was not made half a century ago—since the principle has not changed a particle.

Simply because fifty years ago they didn't have the tools, the materials, or the processes.

The farther you look back into the history of industry, the more you will be impressed with the fact that almost everything has improved as rapidly as our ability to produce it has increased.

As steel has improved in quality, and as machines to handle it have increased in capacity and accuracy, just so rapidly has the steam-engine been improved.

As men learned to roll heavier and heavier rails, so the size and power and speed of locomotives increased.

Just as men learned to build larger and more accurate boring-machines so has the size of big guns gone up, and the increasing ability to produce thicker and harder armor-plate has made possible the constant growth in the size of battleships.

The wonderful newspaper printing-presses were an impossibility until papier-mache stereotyping became a practical thing, and until paper-makers learned to make a strip of paper miles long.

But the web of paper was out of the question until the making of wood-pulp paper had been perfected.

And coming back to the original idea of the tool's part, the modern high-speed printing press would have been an impossibility, even with stereotype plates and endless paper, if machine-tools had not been so perfected that the minutest accuracy in gears and rollers became possible.

Wireless telegraphy would never have come about had not the other kind preceded, and it is impossible to imagine the phonograph's being ahead of the telephone.

Without illuminating gas and gasoline, Welsbach lights would never have been thought of or possible.

We would have no electric lights without the dynamo, and no dynamo if wire-drawing had not first been perfected.

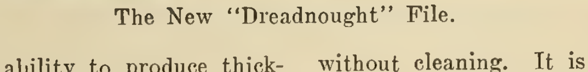
So it goes—everything is dependent on factors that have preceded, and any achievement of to-day is the result of thousands of years of previous effort and thought.

There are no sudden jumps—no leaps and bounds. Upon analysis it will be found that progress is a slow growth.

And the knowledge that we are adding to the world's store to-day is but the foundation for further advance by men to come.—Silent Partner.

IMPROVED FILE.

A new file, the "Dreadnought," has just been placed on the Canadian market. It embodies the simplest and most radical improvement in files ever conceived, and is one of the greatest labor-saving tools invented. Although files have been in use for ages, no great progress in the methods of manufacture or shape of tooth took place until now. But the Dreadnought, which is a circular-tooth file, having a milling cut, practically revolutionizes the tool. The semi-circular teeth on both sides cut deep and equally well, soft and tool steel, cast and wrought iron, bronze, and all other hard metals. Owing to its self-clearing properties it cuts brass, lead, aluminum and other soft metals without cleaning. It is also invaluable as a wood and farrier's rasp, as well as for slate and marble, etc. The tool cannot fail to prove of the utmost value to mechanics.



The New "Dreadnought" File.

This file is being placed on the market by J. H. Hanson Tilley Co., 422 St. Paul St., Montreal.

The Method Followed in Manufacture of Drop Forgings

Showing Practice Instaling Drop Hammers and Building Foundations to Withstand the Weight and Shock—Great Uniformity is Obtained.

Before the invention of forging with dies, or what might be called "machine blacksmithing," and when an ordinary hand hammer was all that was available, it was impossible to cheaply produce uniform forgings. Now the situation is entirely changed and in the present state of the art drop forgings can be made of tobin bronze, copper, aluminum, iron or steel, using for the pur-

Fig. 1—600-lb. Drop Hammer.

pose dies which are made in two parts. These dies are often so made as to combine in one set the roughing or "breaking down" form in addition to the finishing form, although many forgings require separate breaking-down dies and several forming dies, depending on the shape of the forging to be produced.

To determine the proper shape for the breaking-down form it is common practice to make several tests by which it is decided how best to distribute the metal, according to the stock used and the finished article to be produced. These dies are operated in drop hammers the size of which is governed by the work to be done. The falling weight may be as light as 50 lb. or as heavy as 5,000 lbs. Fig. 1 shows a drop hammer with a 600-lb. falling weight. One-half of the die is fastened to the ram or hammer which moves vertically between two guides or uprights, being raised by friction rolls which are under the instant control of the operator. The other half of the die is in the anvil or base of the hammer. The ram of the hammer is lifted until automatically released, the height of the fall being controlled by adjusting the dogs on the side rod which release the lifting rolls. Then the hammer falls, striking the previously heated bar or billet with the upper half of the die and driving it into the lower half of the die. By a number of blows in rapid succession the stock is quickly hammered into a shape that will distribute the metal so as to secure the best results in the forming die from both an economical and operating point. The piece in this shape is next placed over the finishing form in the die and by a number of blows forced into the concavities in the two dies. It may be necessary to reheat the stock between these operations if the nature of the work or the stock used compels it.

Around the finishing depressions in the faces of both dies is cut a shallow space called the "flash" of the die. This allows for the inequalities in the rough forging, as it is practically impossible for the drop forger to produce the exact shape and the size required without surplus metal, and this space in the flash provides for the overflow. The forging as it comes from the finishing form, therefore, has a fin formed where the upper and lower dies meet. This is removed in trimming dies operated in a type of press such as is shown in Fig. 2, usually located alongside of the hammer. The character of the trimming is such that cut-back or overhanging frames are often more convenient than those of the straight-sided pattern, as illustrated in Fig. 2; this overhanging type is particularly adapted for trimming long drop forgings, as the stock can readily be fed from right to left through the throat of the frame. When trimmed the forging is either annealed or pickled, or, if necessary, both, after which it is ready for the machine operations if there be any. Fig. 3 shows

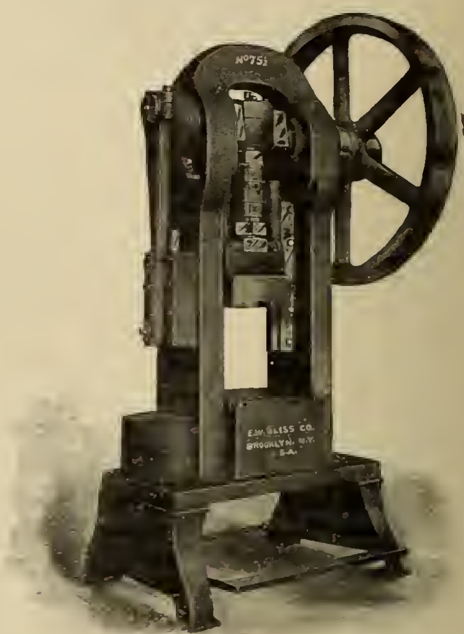


Fig. 2—Straight-Sided Trimming Press.

a pair of dies and its product before and after being trimmed.

The endurance and effectiveness of the drop hammers depend in no small de-

Fig. 3 Drop Forging Dies and Their Product Before and After Trimming

gree upon the proper ratio between the weight of the base and the weight of the hammer. It has been demonstrated that 12 to 1 is decidedly better than a

smaller ratio, and that the best results are obtained with a ratio of 15 to 1 or 16 to 1, with all parts made in proportion, the extra cost of the heavier

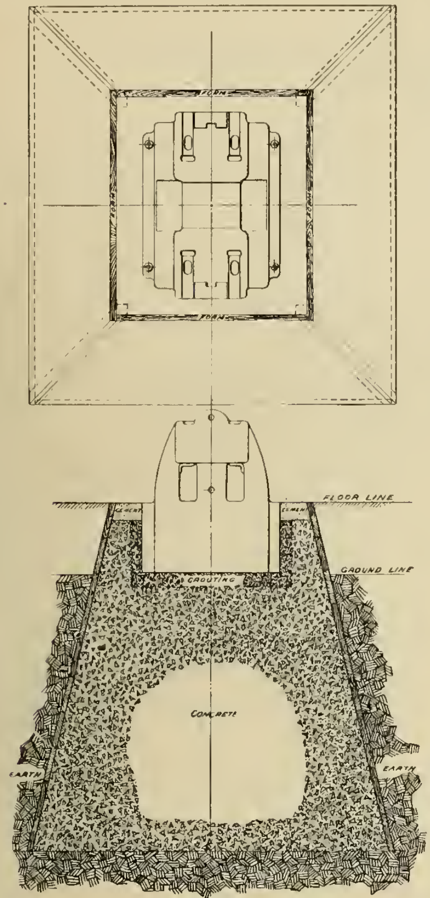


Fig. 5—Plan and Sectional Elevation of a Solid Concrete Drop Hammer Foundation.

machine being more than compensated for by the larger quantity and better quality of the finished product and by the comparative freedom from breakdowns.

For the successful operation of drop hammers it is very essential to have a good foundation; either one of the types illustrated in Figs. 4 and 5 have been found satisfactory. The wooden cushion foundation, shown in Fig. 4 is used where the ground is not very good and where jarring of surrounding buildings is objectionable. The solid concrete foundation shown in Fig. 5 is recommended as best when it can be used, as it is like a continuation of the base of the hammer and therefore makes the drop more efficient.* In deciding the depth of foundation of either of the above types care should be taken to determine the best point to stop the excavation. Bed rock is the best bottom, cement gravel next best, and then a strata of sand or clay, say 4 feet thick, which if left undisturbed in its original condition also makes a good bottom. The trouble with sand or clay is that the heat of a drop forge

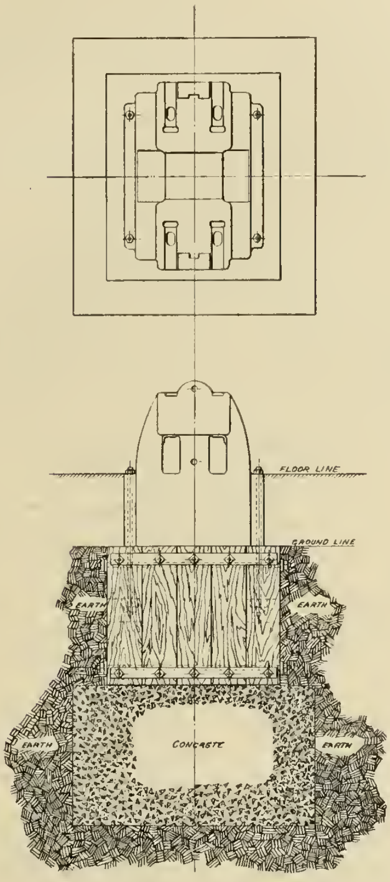


Fig. 4—Plan and Sectional Elevation of a Drop Hammer Foundation with Wood Cushion.

shop dries the soil, and with the continual jar they are apt to shift if they have opportunity to do so. By flaring the bottom of the foundation the desired result is sometimes obtained without going very deep, but for any size of drop hammer the concrete should not be less than 4 feet thick, whether the wood cushion is used or not.

The forgings produced by the drop hammer are perforce uniform, being formed in the same dies and under similar conditions. Difficult shapes can be readily, rapidly and accurately made, leaving allowances for machining if desired, or finishing when no machine finish is required. In the latter case the cost of manufacture is greatly reduced and the smooth and accurate surface left from the dies generally answers for such articles as handles, wrenches, cranks, connections and bossed parts. Or, should appearance require a bright and polished surface, such may be given by an emery wheel or buffing machine.

The field for drop-forged products is very large; in fact, almost unlimited. There is a great demand for them in the manufacture of firearms, sewing machines, bicycles, automobiles, engines, railroad cars and in many kinds of machinery. The economy in the use of drop forgings has been recognized where the strain requirements are great and the part requires considerable machining, as by their use the amount of machine labor necessary is very materially reduced. Fig. 6 shows an assorted lot of forgings produced in machinery made by the E. W. Bliss Company, 20 Adams Street, Brooklyn, N.Y.

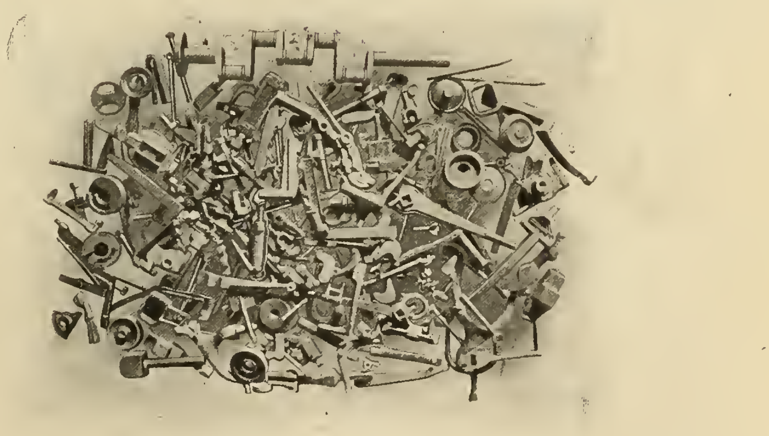


Fig. 6—Forgings in a Variety of Sizes and Shapes.

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* Many users of drop hammers have, and recommend a cushion of two thicknesses of 4-inch oak laid at right angles between concrete and drop hammer base.—Editor.

BAIT.

If you can't give the boss your best efforts, find one to whom you can. You'll find it better in the end.

Of course we all make mistakes—but that's a pretty poor excuse.

Scattering one's energies is like trying to kill an elephant with a shot-gun.

There is a limit to every man's capability—but few men reach their limit.

War is the poorest form of activity that a nation can manifest.

MACHINE SHOP METHODS AND DEVICES

Unique Ways of Doing Things in the Machine Shop. Readers' Opinions Concerning Shop Practice. Data for Machinists. Contributions paid for.

A TALK WITH OUR READERS.

In the October issue we inserted a small notice asking for practical articles giving good ideas for jigs, and methods and devices to lessen labor and save time in the machine shop. We received a great number of replies and in the pages of methods and devices are many good ideas contributed by practical men.

We have still some in reserve, but we want more of this class of articles. It will help you to write down a description of the work you are doing, or of a short method you know about for accomplishing some job. You may have data arranged in useful form. We will pay you liberally for these and writing them down will crystallize out your ideas. You will understand the work better after explaining it to others.

The only stipulation is that the articles contain a useful idea. Make a sketch to illustrate if possible. It may be rough, but we will attend to that and prepare both article and illustration for publication.

Address Canadian Machinery, 10 Front Street East, Toronto, and it will reach the Editor.

MACHINING PISTON AND RINGS.

By M.A.C.

Chuck the piston casting in drill press jig and ream the open end taper. Reverse the jig and centre the piston head with combination drill and countersink. By referring to sketch you will under-

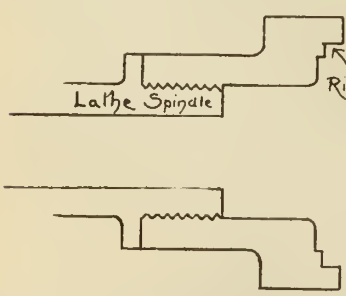


Fig. 1.—Spring Chuck for Facing Rings Before Cutting.

stand method of handling them in the lathe. In Fig. 5, A is piston taper, B is centre made by second drill press operation, C is cast iron cone turned to same taper as the open end of piston, reamed in first drill press operation, D is steel driver squared, a loose fit between bosses of piston, and is screwed into C. Turn the piston to diameter and groove for rings with gang tools. These drivers may be used on pistons up to 12" in diameter and generally

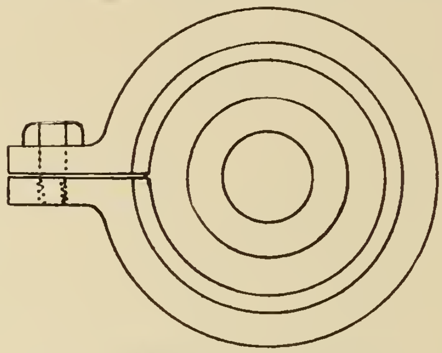


Fig. 2.—Machining Piston Rings.

three sizes of pistons may be machined on one cone.

Piston Rings.

Instead of the four lugs used on nearly all ring castings for bolting to face plate of lathe, Fig. 4 shows two ⅜" bars on the outside of the cope end of the pattern. These bars cross the centre at right angles and are useful in drawing and tapping the pattern. They never break in the tumbling mill. The four jaws of the lathe chuck close on them solidly and all of the casting may be used. Remove the surplus stock at one cut. Bore finished size and finish outside of ring to a diameter varying with different sizes of ring. Cut off 1-64 wider than finished width, and face both sides in spring chuck screwed on lathe spindle shown in Figs. 1 and 2.

Cutting the Ring in Milling Machine.

For cutting the rings use jig in Fig. 3. A is a cast iron base with tongue G fitted to slot in milling machine table and bolted to it with two bolts through pass holes HH. B is loose plate, diameter of bore of ring cut and 1-32 less in thickness than width of ring F, with centre hole D diameter of C. Stud C screwed tight into base A and centres plate B.

Fork clamp D is slotted to slip under

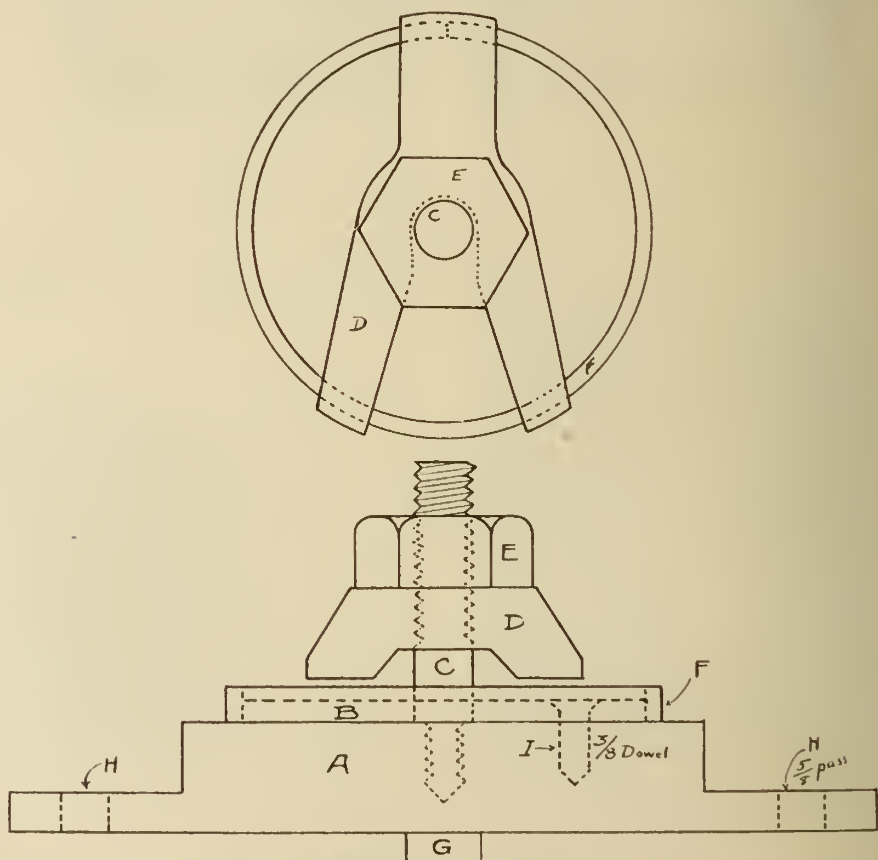


Fig. 3.—Machining Piston Rings.

nut E, which tightens the different parts together. A ⅜" countersunk head machine screw I passes through plate B and is tapped into A, preventing B from

lifting. Mill gap in ring, slack nut E, turn ring F over and repeat the opera-

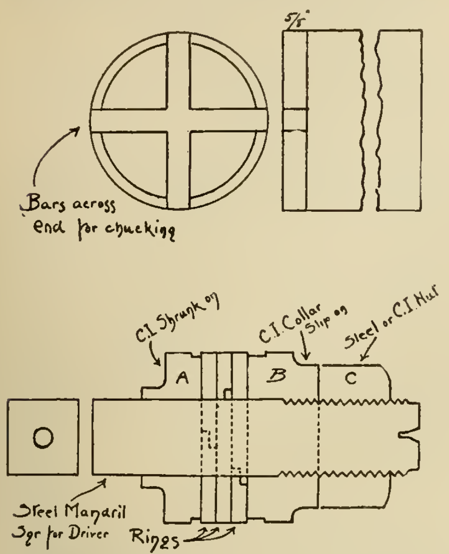


Fig. 1.—Mandril for Turning Rings After Cutting.

tion. One base will do for several sizes of rings by making different plates B. As the ring is well backed by plate B a heavy feed can be made with the milling cutter.

Finishing Rings to Diameter.

Use a clamp mandrel and sizing ring shown in Fig. 4. For a ring that finishes 4" outside diameter bore the size 4 1-32 inch. Fit the rings to the sizing ring and holding the driver end of the mandrel in the vise drop the sizing ring over it. It will be centred by the collar A on the driver end. Slip on collar B and screw nut C down tight. Remove the sizing ring and turn to required diameter. A lathe hand can turn off rings as fast as a boy can put on and take off rings, using two mandrels.

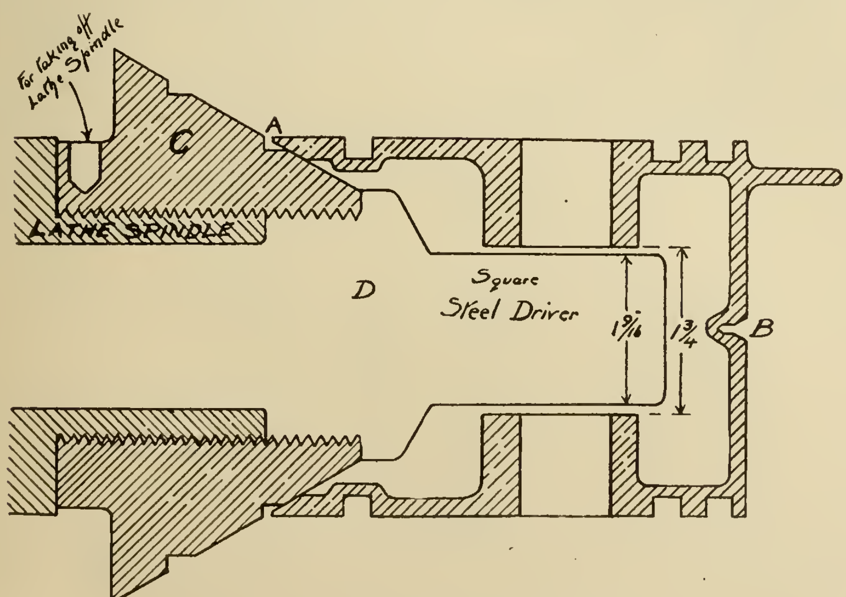


Fig. 5.—Grooving and Turning Pistons.

A SET OF PRESS TOOLS.

By W. Jenkins.

Fig. 6 shows a plan view and sections of the two halves of a float made from .020" stock. Figs. 1 and 2 are a section and plan of the die for the first operation shown at No. 1, Fig. 6. In Fig. 1, A is the cast iron base, B the blanking die, C the blank holder which also serves to strip the formed blank from the die, C being connected to a rubber spring below the die by the rods L. D is the forming punch, FFF are three punches, Figs. 1 and 2, to form the three small bosses shown at Y, Fig. 6. E, Figs. 1 and 2, are two gauge pins to gauge the stock.

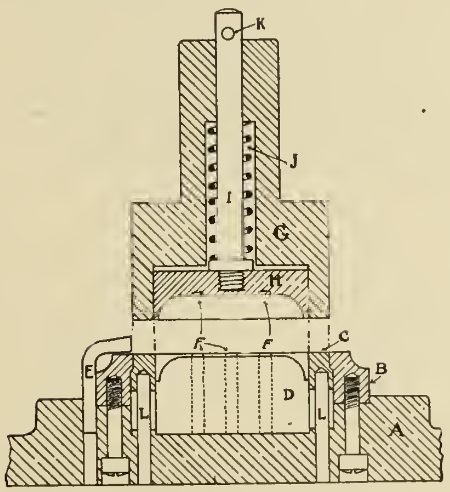


Fig. 1.—Press Die.

Fig. 3 shows a section through the die which performs the second operation on piece No. 3, Fig. 6. In Fig. 3, L is the die base, M is the forming die, Z is the trimming die which trims the edge off the piece after it has been formed. P is a punch for punching the

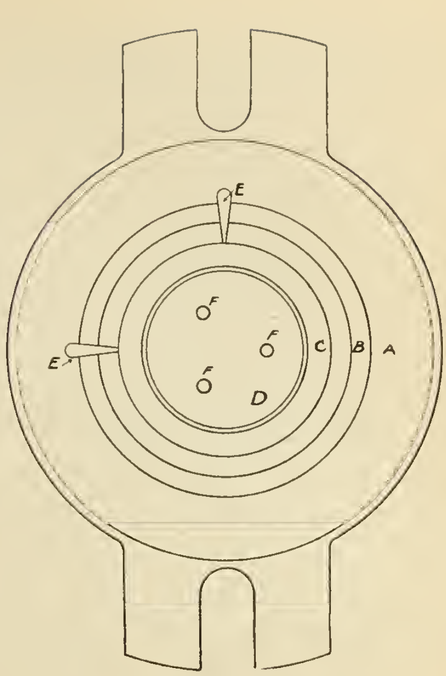


Fig. 2.

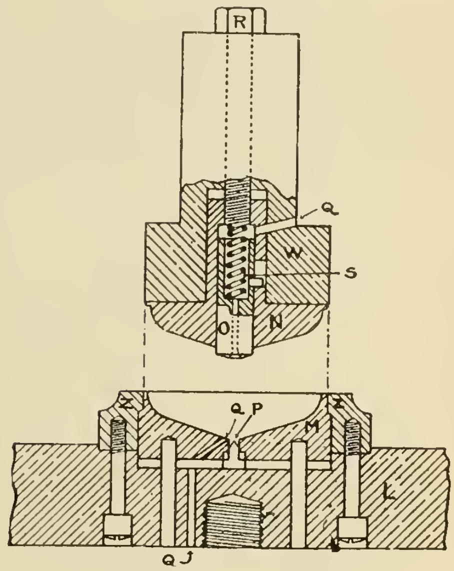


Fig. 3.—Press Die.

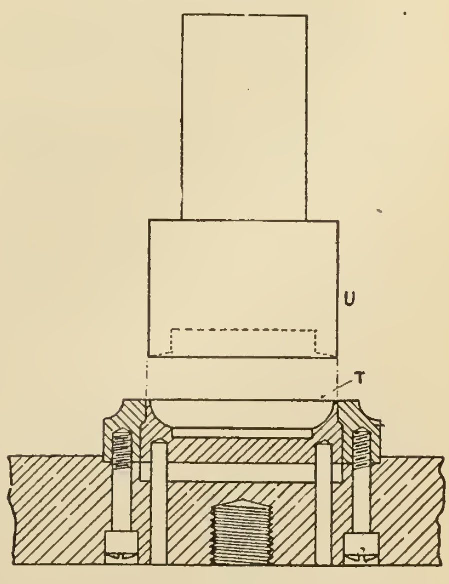


Fig. 4.—Press Die.

hole shown at XX, Fig. 6; QQ is a hole to let out the air. The forming die M

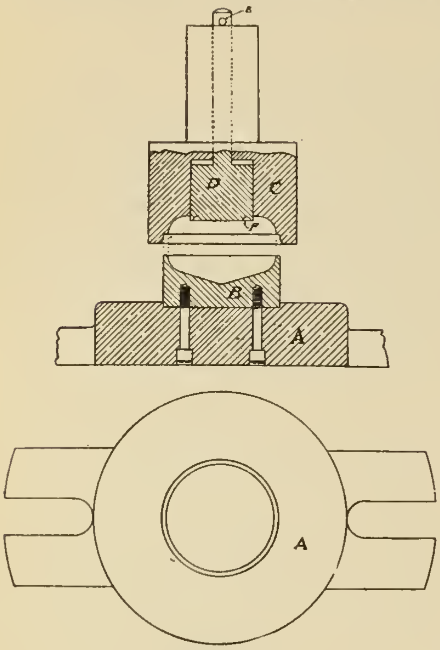


Fig. 5.

is also connected to the rubber below the die by three rods, two of which are shown. W is the trimming punch, N

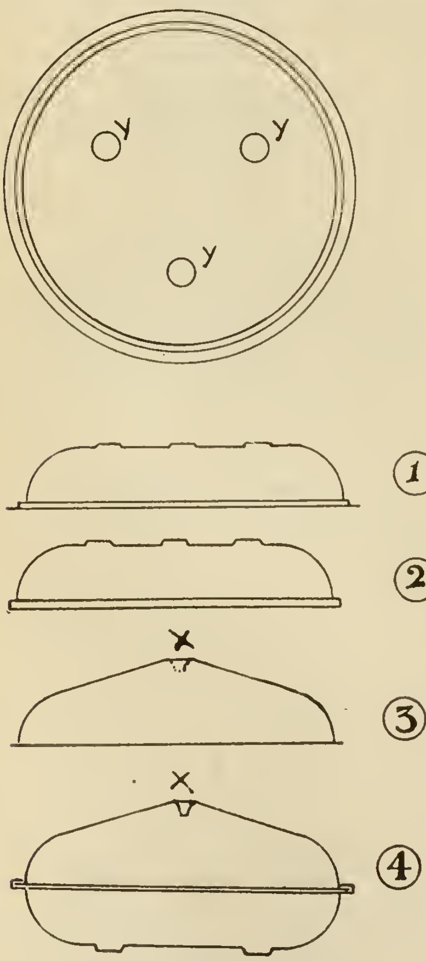


Fig. 6.—Finished Work.

the forming punch, and O the centre piece, and spring S removes the blank from the punch N. Q is an air vent to prevent suction. The centre piece O is held from falling out by a pin working in a slot shown. The punch N is held in place by the screw R. The first operation on this piece is also done in the punch and die shown in Figs 1 and 2, the three punches FFF being taken out for this purpose. The edge trimmed off by die shown in Fig. 3 is stripped from W by a stripper.

Fig. 4 is a section through the die for trimming the bottom half shown at No. 2 in Fig. 6. T locates the blank and U is the punch.

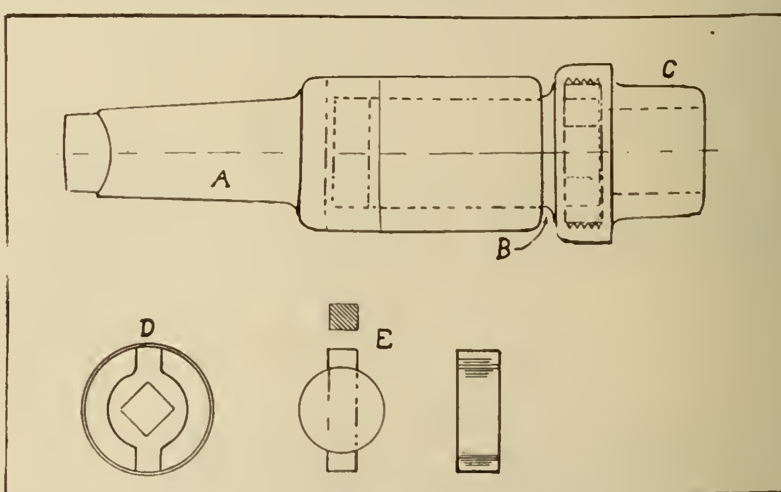
Fig. 5 shows a section and plan of the die for closing the two parts together, on the fourth operation, which is done at one stroke of the press, as shown at No. 4, Fig. 6. The two pieces are put together in the die B. In Fig. 5 A is the bolster, C is the closing punch, D is the knock out, and is held from coming out by the pin E; F is a groove to clear the three bosses at Y.

TAPPING CHUCK.

By Wm. J. Hurley.

The body A with shank to fit machine is bored to receive the sliding spindle B and slotted to allow the driving key E to slide up and down, the key being fitted tight into B. The lower end of the latter is bored out to receive the driver D, and two slots are cut across the face of the tails to enter; the driver has a square hole in the centre to suit taps.

The end B is threaded right hand to suit the sleeve C, which serves to hold driver D in place and guide the tap. This chuck can be used for either right or left hand taps.



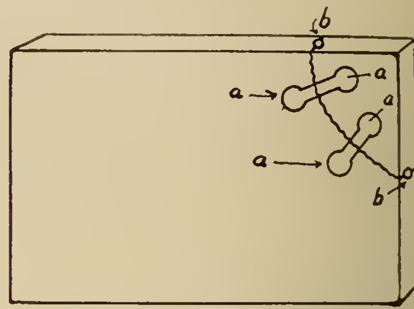
Tapping Chuck.

REPAIRING A PRINTING PRESS.

By Hugh A. Carmichael.

A broken bed plate casting off an ordinary Gordon printing press was brought in for repairs, the upper right hand corner being broken completely off. The plate was about ⅝" thick, being planed on one side. The other side had flanges from the centre out. It being absolutely necessary to have this planed surface perfectly smooth, I was unable to use straps as there was no room on other side.

After considering several methods I decided to do as follows: Referring to the sketch, after clamping the broken pieces together I drilled four ⅝" holes,



Repairing Printing Press Casting.

a, a, a, a, countersinking them slightly. I then marked two lines 5-16" apart, connecting each two of said holes, and after taking clamps off I sawed out part between lines. After putting clamps on again and putting pieces in position, I drilled two ⅜" holes in edges of plate at b, putting in a soft rivet, which prevented broken parts moving in that direction, the holes being drilled half in each piece. I then warmed the whole plate well and laid it with the planed side down, on a flat surface.

Using a small wrought iron ladle, I melted enough brass to fill the openings a, a, a, a. When cool I found the brass had shrunk enough to draw the pieces together so tightly as to almost hide the crack. After dressing the brass off on the planed side of plate, I put the plate back on the press and it appears to be as strong as before it was broken, and at a cost of only a few hours' work and scarcely any delay, where a new piece would cost probably $15 to $25 and mean considerable delay.

HANDY CENTERING MACHINE.

By John Egan.

Enclosed is a sketch of a device which has been in use in the shop for a number of years, and where there is a large number of shafts to centre is a very useful tool.

A is a heavy cast iron block to rest on the floor, with a cone-shape hole in it to receive one end of the shaft to be centred, also a hole to seat the shaft C firmly.

B is a sliding block fitted on shaft C with gib D so as to bring the cones in A and B directly in line.

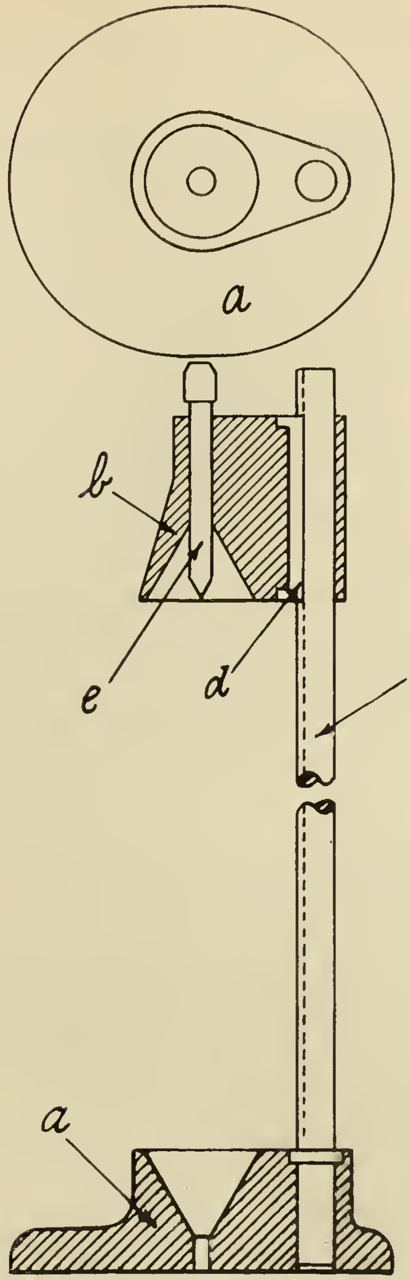
E is the punch for centreing the shaft.

HANDY TRUING METHOD FOR CHUCK WORK.

By E. S. Cooper.

In a jobbing machine shop there are always pieces requiring to be handled in the lathe chuck that must be exactly true on the face to make a proper job. If it is possible to force one face that has been machined off, against the body of the chuck, that simplifies the operation. If that cannot be done and the piece to be machined must be caught at the ends of the chuck jaws it often takes a great deal of time to get that face dead true.

A simple method to do it is to take a piece of ordinary hard fibre of a width that can be handled easily through the tool post and deep enough to allow a piece of $\frac{1}{2}$'' or $\frac{5}{8}$'' steel to be used on top of it for the set screw to tighten on. The fibre should be faced off top and bottom in the shaper so as to have a good surface for firm holding. Round one end off slightly and when the piece is lightly held in the chuck, force the end of the fibre against the face to be trued while it is running at a good speed and a few seconds are all that is needed to make it absolutely true. By cutting off the other end of the fibre piece to an angle of 45 degrees it will



Handy Centering Machine.

be found to be just the thing to use when square centering shafts already turned. When the work is in the rough then the fibre is not necessary as it will cut away fast and an ordinary piece of steel will answer.

When a large number of pieces have to be done that must be caught out at the jaw ends a very good device to avoid having to true each one can be made. Make a collar about 1-16'' less in diameter than the inside of jaws will be when closed down on the work and with large enough hole to allow for clearance of boring tool if necessary. Counterbore this back $\frac{1}{8}$'' deep and to within $\frac{1}{4}$'' of outside diameter of the collar. Now grind away this narrow face, leaving only three small sections of it for the casting to rest against. By keeping the casting firmly against this collar while fastening it in the chuck the face truing is eliminated from the job.

JIG FOR TURNING LARGE CONE.

By J. H. R., Hamilton.

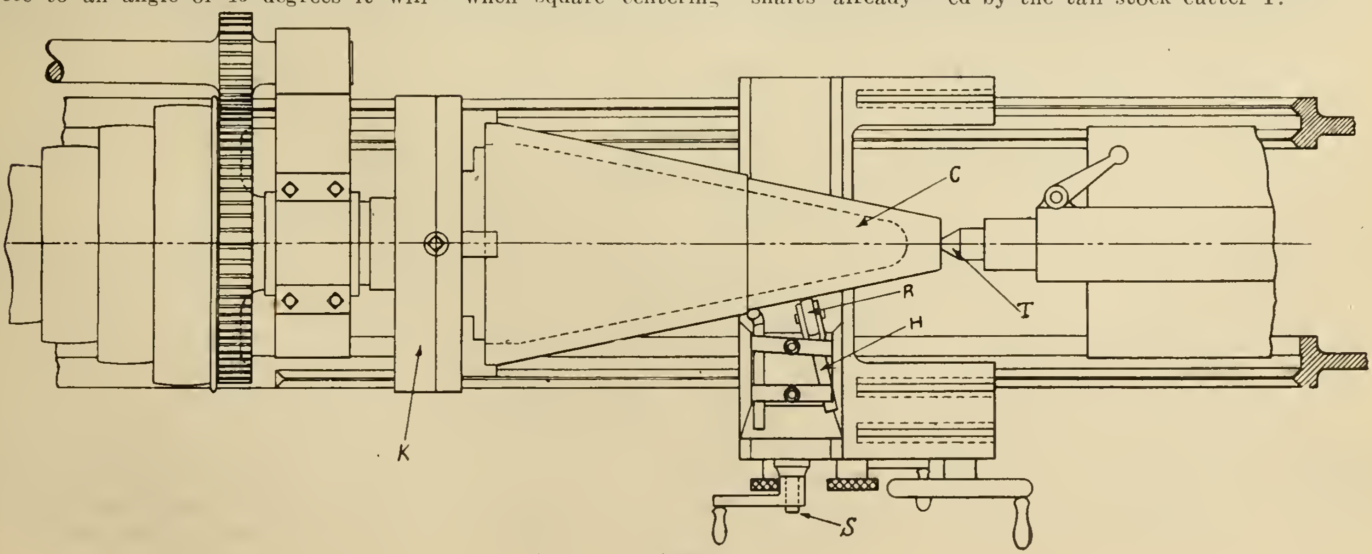
The accompanying illustration is of an arrangement that we used in turning a large cone in the lathe. There being no taper attachment on the lathe and the compound rest only having a travel of about eight inches, it would have been a somewhat tiresome job to go over the cone (a length of over four feet) with the compound rest.

The compound rest was set to the proper angle and a cut taken for about four inches up from the small end of the cone.

The holder H with hardened roller R was then placed in the tool post along with the cutting tool and set to the turned part of the cone.

When the tool and roller are properly adjusted and cross feed screw S removed, the taper of cone will force the tool outwards by means of the contact of roller R on the cone.

The cone is held by the large end in the chuck, the small end being supported by the tail stock cutter T.



Jig for Turning Large Cone.

DEVELOPMENTS IN MACHINERY

New Machinery for Machine Shop, Foundry, Pattern Shop, Planing Mill; New Engines, Boilers, Electrical Machinery, Transmission Devices.

ELECTRIC WALKING JIB CRANE.

A jib crane of interesting design has been installed in the Burnside shops of Illinois Central R.R. Its function is to pick up the wheels and axles, distribute them through the shop to wheel lathes or elsewhere if desired, also to place wheels in storage.

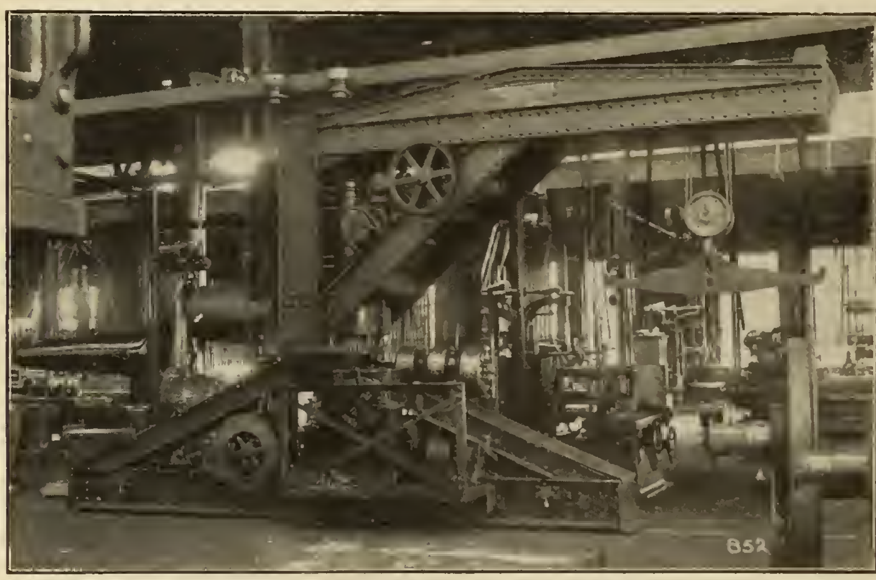
It is of seven tons' capacity, four motor, 12 ft. effective radius—supported on one track rail, top of mast being supported by I beam track; requiring minimum floor space. All wearing parts are easily accessible for oiling and repairs. It was specially designed for this railroad and for the work it will perform. A feature to be noted is that of the low head-room.

The four motors are distributed as follows in the working of this crane: One for traveling crane, one for trolley, one for rotating jib, and one for hoisting.

An important feature is the fact that load is always in absolute control, being automatically sustained at all times. The hoisting gearing is provided with improved double automatic safety brake, so arranged that load may be raised and lowered by power and be automatically sustained. This brake attachment consists of two independent brakes, one electrical and one mechanical. The electrical brake is operated by an electric solenoid in circuit with the hoisting motor, and so arranged as to come automatically into action when the electrical current is off the hoisting motor circuit.

A maximum of efficiency of this crane is claimed for the service it is designed to perform, together with a minimum of cost as to installation and repairs. It is instanced as one of the many crane installations of this company facilitating production in modern plants.

The crane travels on a permanent mono-rail track, running the entire length of the shop at right angles to the erecting pits. The track is laid as close to the columns separating the erecting floor from the machine shop floor as clearance would permit, so that the crane serves the erecting pits on one side of the track and the wheel lathes on the other.



Whiting Electric Walking Jib Crane.

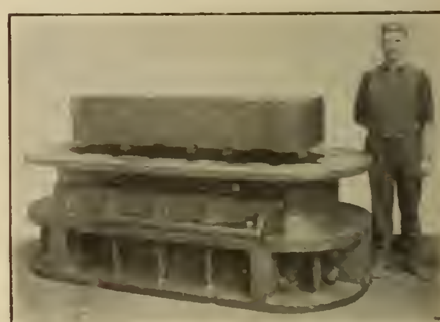
The hoist motor of 15 h.p., hoists 16 ft. per minute. Trolley rack motor, of 2 h.p., racks trolley on jib at rate of 90 ft. per minute. Jib rotating motor, of 2 h.p., swings jib at rate of two revolutions per minute. Crane travel motor, of 10 h.p., travels crane 180 ft. per minute. The jib is fixed in horizontal position and is not raised or lowered. The maximum lift of hook from rail is 10 ft.

This crane shown in the accompanying illustration was designed, manufactured and installed by Whiting Foundry Equipment Co., Harvey, Ill.

A NEW FERRACUTE PRESS.

The frame of the press is composed of four heavy cast-iron columns, each column being reinforced by two 4¾-in. steel rods, the eight rods adding materially to the tensile strength of the columns which are united near their base by heavily trussed cast iron beds and at the top by stays.

The machine is virtually a twin press mounted on an iron base and otherwise connected. This construction allows vertical pressure to be communicated to the double ram at four points, the adjusting gears on the four pitmans being so connected by gearing that one hand wheel moves them all, the adjustment being exceedingly delicate, one turn of the hand-wheel giving 1.1000-in. adjustment. An electric motor forms a part of the adjusting device enabling the adjustment to proceed rapidly where the ram is to be raised or lowered a considerable amount.



Ferracute Press—Dies for Second Drawing on Metal Caskets.

Hanging on to the inner ram by four heavy studs is an outer ram which descends with the inner ram for about half its stroke, and then stops by the blankholder and lower die coming together, at which point it is locked in place by four toggle levers, the pressure being adjustable by nuts on the tie rods. These toggles work on the wedge principle and when forced into place by adjustable wedges upon the descending ram, transfer the pressure of the blank holder to the frame of the

machine and not on the main shaft as in a cam press. This device has been used by the Ferracute Machine Company for many years on small presses, and they are now applying it to large presses. One advantage of this construction is that the whole outer ram may be quickly removed by taking the nuts off the top of the studs and allowing the ram to drop down and be removed entirely from the press. In such case, the machine becomes a single-action press in which the full power of the ram is available and suitable for working cutting dies by reason of its long, accurate and adjustable gibbed slide-bearings. It is claimed by the makers that this transformation of a double-action press into a single-action as above described is a new feature.

The machine is triple geared, all the gearing being cut from the solid, the five large gears being each 5 feet diameter and 10 in. face. The ratio of gearing is 200.

The friction clutch used on the press is of modern type especially adapted for high-speed and heavy service. The stroke of the inner ram or punch is 28 in. As much as 24 in. stroke may be given the outer ram but with the press adjusted as shown in the illustration, the stroke is 14 in., capable of producing a shell of nearly that depth.

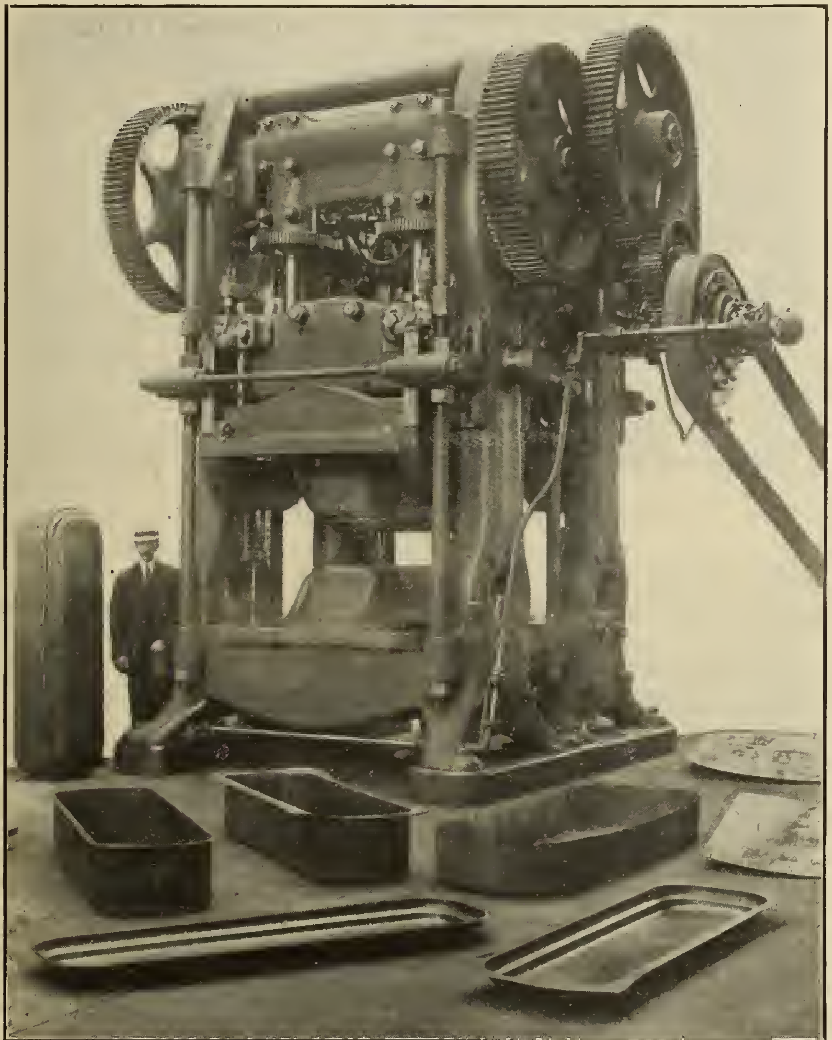
The two crank shafts are each 10 in. diameter, forged from high carbon steel; the pinions are phosphor-bronze.

An adjustable positive knockout attachment is used in connection with the dies, two of the rods which connect the knockout with the ram being shown in the engraving.

This double-action toggle drawing press shown in Fig. 1 has just been built by the Ferracute Machine Co., Bridgeton, N.J. for the Montrose Metal Casket Co. Samples of the work produced in the ponderous machine are shown on the floor.

The press weighs nearly one hundred tons and is capable of exerting a pressure of 1,000 tons. The completed casket is 6 ft. long, 20 in. wide and 12 in. deep. The lid is 4 in. deep, making total height 16 in. including lid. The several operations are: 1st, cutting blank; 2nd, drawing shell to depth of 9½ in.; 3rd, redrawing to the full depth of 12 in.; 4th, trimming edge; 5th, forming edge. The operations of the lid are similar, omitting the redrawing operation. The press is equally well adapted for drawing bath-tubs, automobile bodies, metallic boats, horse-troughs and numerous articles of large size in steel or copper.

Dies for such large work must, of course, be commensurate in size with the product. The dies illustrated in Fig. 2 are smaller than one would suppose was necessary. The engraving shows the drawing dies for the last drawing operation, the lower die being shown on the floor, the upper die or blankholder resting upon it with the punch suspended above.



Ferracute Press—1,000 Tons Pressure.

ALL GEARED DRIVE SHAPER.

This new Stockbridge shaper embodies the special features common to all their shapers, and several new features. It is an all-geared drive as, is seen in the gear box construction.

From the illustrations, Fig. 1 and section in Fig. 2, it will be seen that in all 10 changes of speed for each position of ram can be had, 5 with the direct drive and 5 with back gears. The handle A operates the plunger, which in turn raises the wedge pin, which expands the friction ring on which the gear is carried. The gear necessary to give the required speed to ram is found from the dial B in the centre of the hand wheel. This dial is marked with numbers giving strokes of ram per minute for each gear. A single turning of this dial brings the gear desired in position to be engaged, when the plunger is operated, without engaging any intermediate gears. Any adjustment of the friction ring that may be necessary, owing to slight wear, is provided for by means of a screw which can be adjusted through hand hole in back of gear box. Hand wheel C is of use in moving ram by hand in case it is desired to do so. The gears run in oil and the boxes are all bronze bushed and provided with self-oiling bearings. The gear box being at the back of the shaper and bolted direct to the column makes not only a stringer stiff drive, but its compactness is quite an advantage.

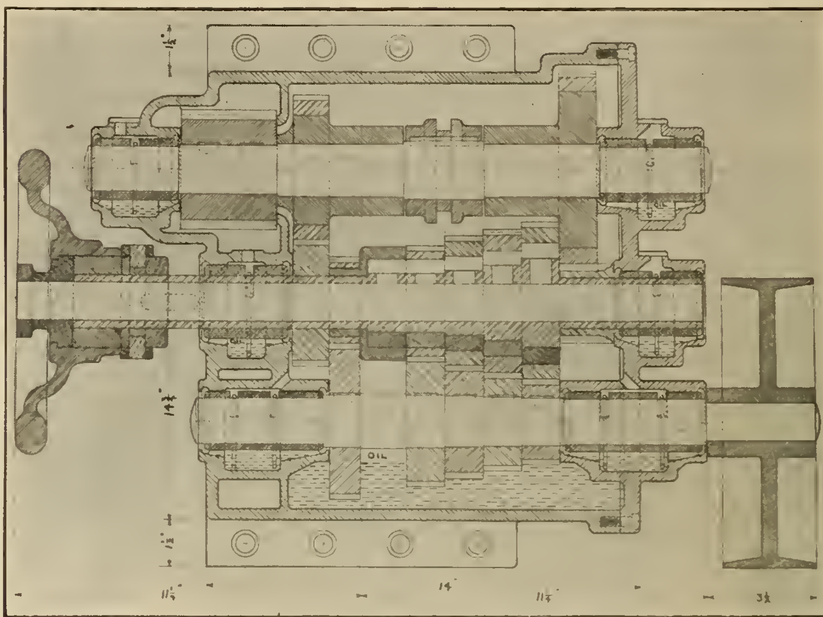
The Stockbridge patented two-piece crank is used on this machine, and the extra power developed makes necessary special design in the other parts,

in order that the power so developed may be delivered at the tool point. Besides the increase in power, this crank motion gives an even cutting speed the entire length of cut, and a quick return of between 3 and 4 to 1. The construction of this crank motion is such that a very fast return is obtained without jar to the machine. The speed of return, while very high through the centre, is gradually brought to zero at either end, reversing the stroke easily and smoothly.

In the construction of the rocker arm special attention was given to its design, as it is through this piece that the motion of the crank is communicated to the ram, and it must be of sufficient stiffness to carry the power developed in the crank. The rocker arm is made, as shown in section drawing, with a cored U-shaped rib on either side, giving as rigid a construction as could possibly be made. The slot in the rocker arm is made of unusual depth and width to provide ample bearing surface for crank pin block. The rocker arm is held between two boxes at the bottom and tied to the ram at the top, preventing the possibility of any tendency to twist.

The ram D is of new design. The object of carrying the top down part way on a small circle with the straight sides the rest of the way is to gain in stiffness, preventing . possibility of buckling. The ram is well braced and ribbed on the inside.

The automatic feed to head E is the same construction as used for a number of years on their other shapers with success, and is "Fool Proof." This feed screw F is provided with micrometer collar graduated to read to one thousandth of an inch.



Stockbridge Shaper—Section of Gear Box.

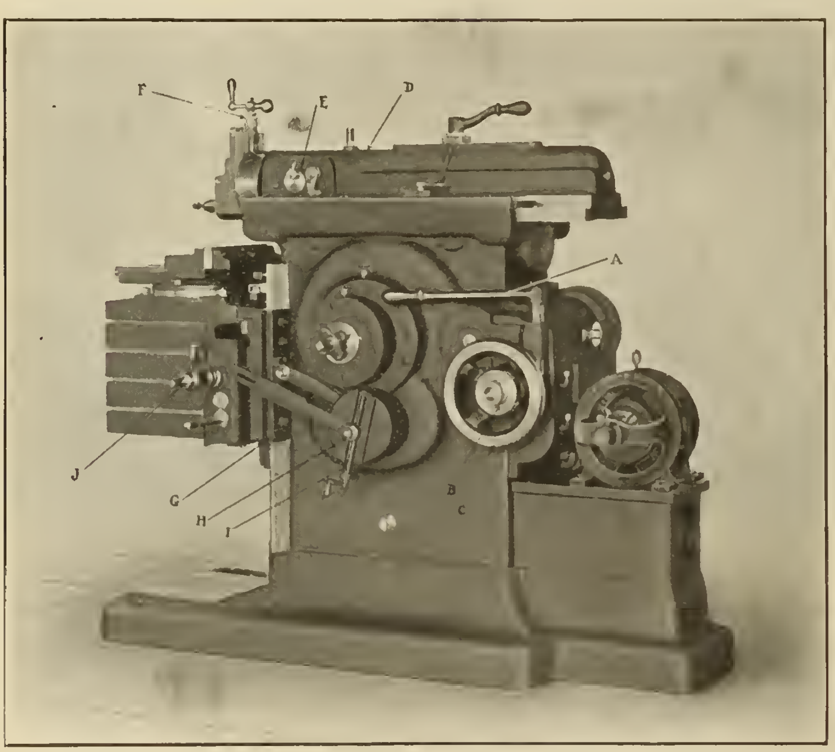


Fig. 1—Stockbridge All-Geared Shaper.

In the ram gibs we have made a departure from general design. On the working side of machine, the side is solid with column. On the other side, the gib is made complete in one piece and bolted direct to column. Taper packings are provided for taking up wear, and the whole construction adds considerably to the stiffness of shaper.

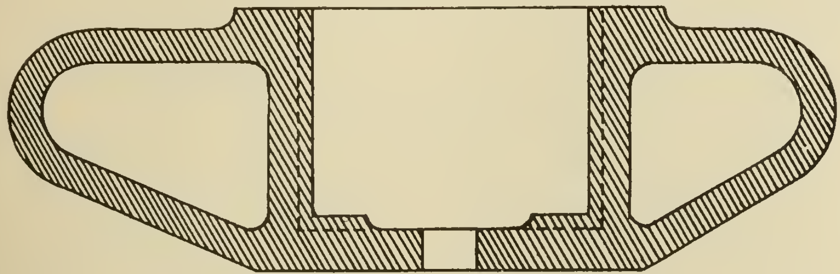
The method of attaching bar to column, while not in itself different from practice that is familiar to everyone on milling machines, for instance, has been applied to these shapers. With this construction there is one solid gib cast to the bar, which, in addition to extra stiffness, prevents all possibility of bar tipping away from column when gib on the opposite side is loosened. The adjusting gib G is on the working side of machine, and by simply tightening the two binder screws, the bar is locked to column, as if it were part of it. In this way the time necessary for the operator to go around on the opposite side of machine to unloosen and then to tighten binder bolts, where two loose gibs are used, is done away with.

The cross feed arrangement is especially interesting because of the entire absence of exposed parts; the mechanism being entirely enclosed. The cross feed block H is so constructed that the direction of the feed is determined by the position of the block, whether on one side of centre or on the other side. Adjusting the block by means of the screw I from one side of the centre to the other changes the direction of the feed. The adjustment of feed can be made while shaper is in operation. Cross feed screw J has a micrometer collar graduated to read to one thousandth of an inch.

The driving gear, in addition to the large bearing surface on its face, has its hub supported both on the outside

and inside, thus doing away with all possibility of buckling, when shaper is on a long stroke.

This machine is supplied with either revolving table or regular box table. Vise is of swivel type, having graduated base reading to degrees. Base is



Rocker Arm—Stockbridge Shaper.

extended well out in front and has cored T slots for bolting work to base. For motor drive, the base is extended at the back and built up to receive motor. Any constant speed motor can be applied; however, speed of about 1,200 r.p.m. is recommended. In case of single pulley drive, regular base (without the extension for motor) is used and pulley is put on in place of gears connecting motor.

This shaper was designed by Stockbridge Machine Co., Worcester, Mass., who are placing it on the market.

TRIPLE-GEARED, HIGH-SPEED RADIAL DRILL.

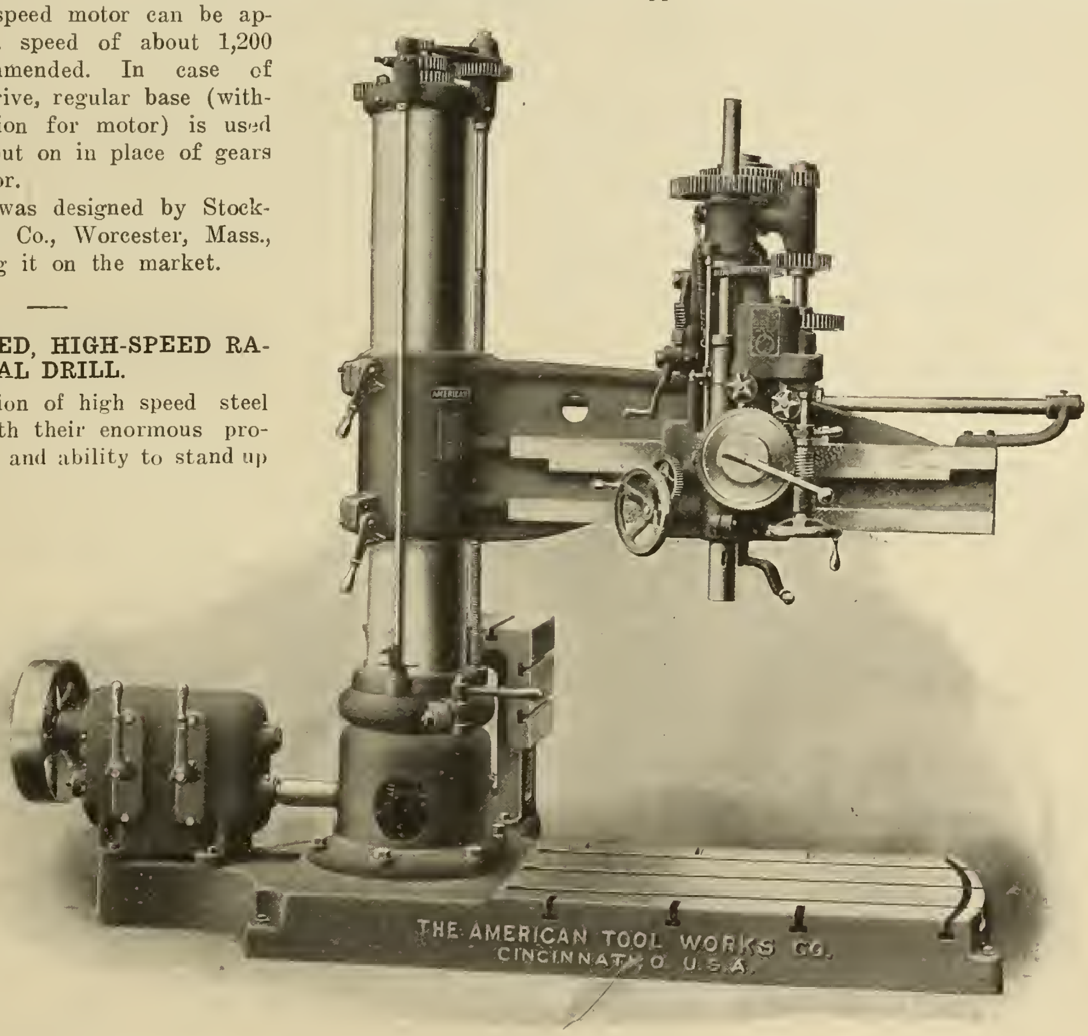
The introduction of high speed steel twist drills, with their enormous productive capacity and ability to stand up under speeds and feeds previously unheard of, also, the inevitable supplanting of the upright by the radial drill for "all around" purposes, has led us to bring out a full line of radials, having 2 ft., 2½ ft., 3 ft., 3½ ft., 4 ft., 5 ft., 6 ft. and 7 ft. arms, one size being herewith described.

The feeding mechanism on the head provides eight distinct rates of feed, covering a carefully chosen range, in geometrical progression, from .0066 in. to .0633 in. These feeds are all readily obtained by the simple turning of a dial on the feed box until the desired feed, indexed thereon, comes opposite a fixed pointer. This method of feed change is simple and requires no reference to index plates and subsequent handling of levers. Feeds operate through a friction, which permits a drill being crowded to its limit. Feeds can be automatically tripped at any position of spindle by adjustable trip dog and pointer, acting on the worm clutch. Depth graduations are on the spindle, and all depths can be read from zero. Two or more dogs can be supplied, making it possible to counterbore any number of holes without resetting. The trip acts automatically at full depth of spindle preventing breakage of feed mechanism.

The speed box is very powerful, of the geared friction type, providing four changes of speed, each being instantly available by use of the two levers shown. Frictions are of our "patent" double band type, employing very few parts in their construction. There is absolutely no shock to the parts when throwing in any speed.

A motor of any type may be attached by various methods, connection being made either direct or through gear, chain or belt. The motor on base connected by gear to 4-speed box is the most simple, efficient and serviceable method.

The spindle has twenty-four changes



American Triple-Geared High-Speed Radial Drill.

of speed, ranging from 18 to 356 in geometrical progression, all immediately available without stopping the machine. Spindle is counterbalanced and has frictional quick advance and return. Column is of double tubular type. Sleeve or outer column revolves on conical roller bearings, hardened and ground and is clamped in any position by our "patent" V clamping ring. This makes the outer column practically integral with the inner column, which extends the entire height, and has full bearings for outer column at both top and bottom.

The arm is of parabolic beam and tube section, giving greatest resistance to bending and torsional strains. Its design leaves the lower line parallel with the base, and thus permits work being operated upon in close proximity to the column without the necessity of an extreme reach of spindle. Arm is clamped to column by two binder levers, obviating loose wrenches, and is raised and lowered rapidly by a double thread coarse pitch screw, hung on ball bearings, and controlled instantly by a convenient lever.

The head is moved rapidly along the arm by hand-wheel operating spiral pinion in rack—a device self locking at all points, it being necessary to use the hand binder only for the heavier operations. Triple gears are located on the head, thus bringing the greatest speed reduction direct to spindle. They may be engaged or disengaged while the machine is in operation by a most convenient lever.

A tapping mechanism is carried on the head, between the triple gears and speed box, thus giving to the frictions the benefit of the triple gear ratio, making unusually heavy tapping operations possible, and also permitting taps to be backed out at an accelerated speed. The lever for starting, stopping, or reversing the spindle, is controlled at the head from the front of the machine.

Base is of massive proportions, strongly ribbed, especially at the point of support of column, is accurately planed and has large T-slots with an ample allowance of metal around them. Table has top surface of 20 in. by 20 in. and also side surface, the latter giving the equivalent of an angle plate. Both top and side surfaces are accurately planed and supplied with large T-slots.

It is manufactured by the American Tool Works Co., Cincinnati.

Enthusiasm is the steam which propels the engine of endeavor, but the boilers should be provided with a safety valve.

SOCIETY OFFICERS.

Canadian Railway Club, Montreal.

President, L. R. Johnson; treasurer, S. S. Underwood; secretary, James Powell, Box 7, St. Lambert, near Montreal. Meetings at Windsor Hotel, 1st Tuesday of each month, except June, July and August.

Central Railway and Engineering Club, Toronto

President, W. R. McRae; secretary-treasurer, Room 409, Union Station. Meetings at Rossin House, 3rd Tuesday of each month, except June, July and August.

Canadian Society of Civil Engineers.

Rooms at 413 Dorchester Street West, Montreal. President, J. Galbraith; secretary, Prof. C. H. McLeod. Meetings will be held at Society Rooms each Thursday until May 1st, 1909.

Nova Scotia Society of Engineers, Halifax.

President, J. H. Winfield; secretary, S. Fenn, Bedford Row, Halifax, N.S.

Quebec Branch of the Canadian Society of Civil Engineers.

Chairman, E. A. Hoare; secretary, P. E. Parent, P.O. Box 115, Quebec. Meetings held twice a month at Room 40, City Hall.

Toronto Branch of the Canadian Society of Civil Engineers.

96 King Street West, Toronto. Chairman, C. H. Mitchell; secretary, T. C. Irving, Jr., Traders Bank Building.

Manitoba Branch of the Canadian Society of Civil Engineers.

Chairman, H. N. Ruttan; secretary, E. Brydone Jack. Meets first and third Friday of each month, October to April, in University of Manitoba.

Engineers' Club of Toronto.

96 King Street West. President, J. G. Sing; secretary, R. B. Wolsey. Meeting every Thursday evening during the fall and winter months.

Canadian Electrical Association.

President, N. W. Ryerson, Niagara Falls; secretary, T. S. Young, Canadian Electrical News, Toronto.

Canadian Society of Stationary Engineers.

President, Charles Kelley, Chatham; secretary W. A. Crockett, Mount Hamilton.

Toronto Branch A I.E.E.

Secretary, W. G. Chace, Confederation Life Building.

CANADIAN SOCIETY OF CIVIL ENGINEERS

On Oct. 29th a paper was read on Straight Air Brake Equipment, by J. B. Parham, at their rooms, 413 Dorchester Street, west, Montreal.

The following is the programme for the November meetings at 413 Dorchester Street: Nov. 12, Mining Section meeting; Nov. 19, General Section, and Nov. 26, Electrical Section meeting.

The Toronto branch of the Canadian Society of Civil Engineers have invited the parent society to hold the next annual meeting, which will be held during January, 1909, in Toronto.

ENGINEERS' CLUB, TORONTO.

At the opening meeting of the Engineer's Club, October 8, a demonstration of Price's Automatic Railway Signal was given. The Price system of automatic signaling and train controlling is a system using electrical circuits. An electrical current similar in volume to that of an ordinary house bell passes continuously along the rails of each block to a coil. This magnetizes the coil and causes it to hold up a small armature. The presence of another train or obstruction on the line short circuits this current, and it ceases to pass through the coil. When this happens, the coil being no longer magnetized, allows the armature instantly to drop, and as a result, a small port located in the cab of the engine is opened, through which compressed air rushes into a chamber, gradually applying the brakes and automatically holding them set as long as may be necessary.

The following was the programme for October, 1908. On Oct. 15 was a club smoker at their rooms, 96 King Street West; Oct. 22, a paper, Toronto Harbor, by W. J. Fuller, and Oct. 29, a discussion, Viaduct vs. Bridges, introduced by F. L. Somerville.

AMERICAN SOCIETY MECHANICAL ENGINEERS.

Franklin Phillips, President of the Hewes & Phillips Iron Works, Newark, N.J., will give an address on "The High Powered Rifle and its Ammunition: Instruments of Precision," illustrated by lantern slides, at the Nov. 10th meeting in the Engineering Society Building, 29 West 39th Street, New York.

SOCIETY OF CHEMICAL INDUSTRY.

Members of the Society of Chemical Industry (Canadian section) filled one of the rooms at the St. Charles Cafe Friday evening, Oct. 23, when they opened their meetings in Toronto with a dinner and smoking concert. Dr. Milton L. Hersey, Montreal, Chairman of the section, occupied the chair and gave an interesting address, being followed by Prof. Ellis, who spoke of the teaching of chemistry in Germany in the early days. Prof. Ellis recalled some very amusing incidents. Dr. W. Lash Miller also spoke, and a number of vocal and instrumental selections were contributed by members.

CENTRAL RAILWAY AND ENGINEERING CLUB.

The regular monthly meeting was held at the Rossin House, Toronto, on October 12. A paper on "The Ordering and Handling of Stores" was read by A. Torey, Storekeeper, G.T.R., London.

On November 17th W. Hall will read a paper on the "Electrification of the Sarnia Tunnel."

C. A. S. E.

The C.A.S.E. are approaching the Canadian Manufacturers' Association with a scheme for the education of the engineer and it is hoped that they will be included in the C.M.A.'s educational scheme.

The 21st annual banquet of the Toronto branch of the Canadian Society of Civil Engineers is to be held at the Walker House, corner Front and York Streets, on Friday evening, Nov. 6, 1908.

FOUNDRY PRACTICE AND EQUIPMENT

Practical Articles for Canadian Foundrymen and Pattern Makers, and News of Foundrymen's and Allied Associations. Contributions Invited.

METAL MARKET.

The Canadian metal markets have shown consistent strength during the month. Considering conditions, most satisfactory business has been done, and the shipping departments generally have worked at good pressure. All the metals have been equally favored, and even antimony has been more in evidence than for many months past. Users seem to be covering their requirements more liberally, although in this direction a greater improvement is desirable. There seems little doubt that, comparing the business of the two countries, more trading is being done in metals here than in the States. For months the New York markets, with perhaps the exception of tin, have been described, day after day, as being "dull" or "unchanged," but this has not been the case in Canada. The last eight weeks especially have been good ones, and the trade done by many firms has been fully equal to other years.

Prices have shown but little alteration, the extreme fluctuations in the primary markets not being visited upon the Canadian ones, although, of course, in the long run, the latter are affected by any steady change. It looked at one time as if both tin and lead were in for a stiffening movement, but the markets in the Old Country fell away and Canadian quotations remained practically unchanged. Copper has been shaded for fair sized orders but looks to be firming again. Imported pig has been scarce in Montreal and some users, in consequence, have been hardly pressed. Those who did not cover themselves properly now see the folly of being too cautious, and leaving off buying until the last moment. Altogether the tone of the Canadian markets continues very favorable, and the slow pace set during the summer seems in a good way of being made up.

Tin in the primary markets has been jumping up and down. At one time a strong bulling movement looked to be in progress, but the trouble in Europe over the Balkans gave the bears an opportunity to squeeze the markets. Consumption is on the dull side, but there is reported in New York a better inquiry on the market for deliveries over the last quarter of the year. Canadian markets have maintained strength in the orders going through, and conditions are firm. In fact, but for the break in the English markets higher prices would be ruling. Jobbing quotations for tin have continued around 32c to 33c.

Copper has been fairly active in Canada. Orders have been well maintained in bulk, but, reflecting weaker conditions in New York, some shading has been done, although for small jobbing lots prices have held steady. The metal in New York has been showing signs of sagging, but is held more firmly again now. Production still goes merrily along, but sellers are holding stocks well, and will not force a sale by cutting. Improvements are being made to the Granby mine which will, it is estimated, give the company a productive capacity of 35 to 40 million pounds annually. The mine will then have a larger production per share of capitalization than any other company barring the Calumet and Hecla. The Dominion Copper Company is in the hands of a receiver. Canadian quotations for casting copper continue to range between 14c to 14½c.

Pig iron conditions show steady strength. There has been a shortage in imported pig, but Canadian furnaces continue to deal with the bulk of the pig iron demand, the fact that steel production is not heavy enabling them to look after the pig iron call more easily. The prospectus of the Canada Iron Corporation, which is a combination of the concerns controlled by the members of the firm of Drummond, McCall & Co., Montreal, has been issued. This company with its capital of $8,000,000 will control blast furnaces, foundries, works and iron mines in the provinces of Quebec, Ontario, New Brunswick and Nova Scotia. There has been a steady improvement in the steel trades in the Old Country, but the United States iron and steel market has not been so active, and apparently no improvement is expected before the election. There has been no important closings, but the industry has shown a tendency to go more slowly.

Spelter has shown fair strength in the primary markets, especially at St. Louis. Consumption, however, has not been brisk. The tendency of the markets has been a firming one. Fair business has been done in Canada, and quotations are unchanged at $5 to $5.25.

Lead looked to be at one time in a fair way of advancing strongly under the stiffening movement in the English market, but quotations across the Atlantic fell away and prices received but little stimulation. There has been a scarcity of lead at Toronto, where slightly higher prices have been ruling. Lead has been ranging from $3.60 to $3.75, which is about 10c higher than in the previous month. Trade has been fairly good, while inquiries have been of a satisfactory nature.

DANIC SAND BLAST MACHINE.

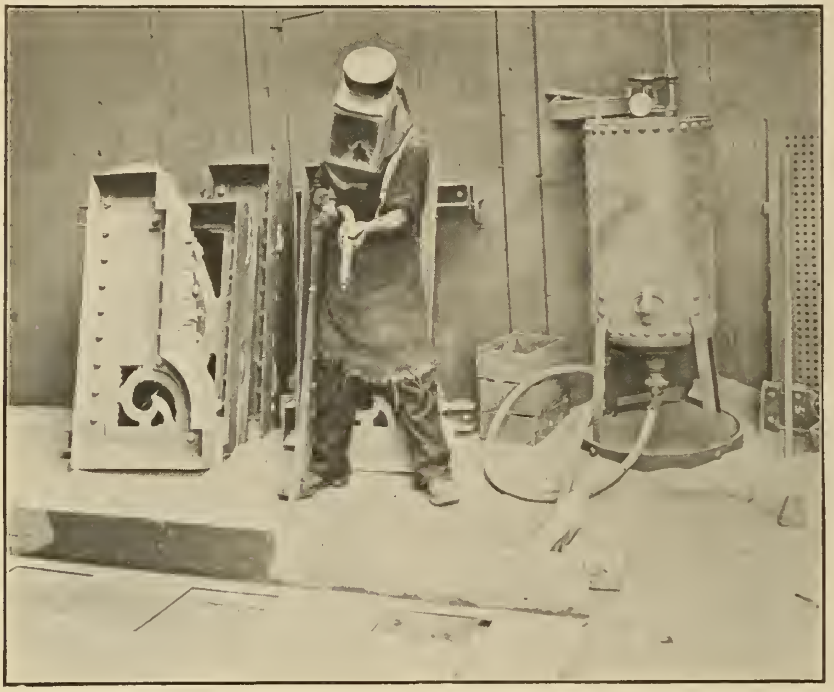
In the Danic sand blast (cut of which is shown) the difficulty experienced by rapid wear of valves has been overcome to a great extent by the use of two valves, one for regulating and one for starting and stopping the flow of sand. By making the valves and fittings of simple and standard types any part which is at all subjected to the action of the sand may be easily replaced.

The two valve arrangement reduces the wear on the valves to a minimum as the regulating valve once set, does not require changing unless for a different class of work. This valve is of the plug-cock type and is located under the bottom of the container, as seen on the cut, and receives the sand by gravity directly from the starting valve.

The starting valve is a heavy cast iron needle point valve seating on a cast iron collar screwed into the bottom of the containing tank. The valve is operated by means of a spindle extending up through the top of the container. This spindle is attached to the valve by means of a swivel so that when the valve starts to seat it ceases to turn, thus preventing the edge of the valve seat from being ground off.

The valves, piping, etc., are either within or under the container and well protected from injury from outside sources. The container tank itself is of heavy boiler plate, tested to 150 lbs. static pressure and will stand rough usage.

The operation of this machine is very simple. After the required flow of sand has once been obtained, which can best be done by adjusting the regulating valve while the blast is in actual operation to start the blast, turn on the air



Danic Sand Blast Machine.

and open the starting valve at the top.

The air supply is taken in at the top of the container and discharged through a pipe extending through the bottom to within a fraction of an inch of the top of the container. This equalizes the air pressure above and below the sand, giving a uniform and positive flow. As the air does not engage the sand until after it has passed all valves the wear on any part of the blast is very slight.

Batcheller, Clark & Batcheller, Inc., 90 West St., New York, are the exclusive selling agents for the Danic sand blast machines.

Method of Repairing Broken and Worn Castings

Broken Castings and Iron Patterns are Repaired with Great Success—In the Following the Method of Fusing is Described.

By ETHAN VIALL.

A good method of repairing worn or broken castings which is in use in some large foundries and machine shops, but which is not known, or at least not used, in the smaller ones, is that of burning or fusing on, of new metal to take the place of the worn or missing parts.

The method lends itself particularly to the repairing of valuable or difficult brass castings, though castings of any metal may be repaired in like manner, the size and nature of the job being limited mostly by the facilities for melting the required metal in sufficient quantity, possessed by a shop or foundry.

For the replacing of parts on ordinary sized brass castings, almost any shop can do the work. A few old molding frames (new ones are easily made) some molding sand, a few hundred pounds of scrap brass, a good sized ladle and a crucible in which to melt the brass, are the principal things needed. An emergency melting furnace can be built up out of old bricks or other material. In a regular foundry means are already at hand.

The accompanying cuts used to illustrate this article, were obtained in the Chicago & Alton Railroad shops, at Bloomington, Illinois, the method having been introduced there by William Hall, machine shop foreman, a number of years ago, and is used every day on all manner of repair jobs. The photographs illustrate the repair of a whistle base, the threads of which were torn out in a wreck. In this job not only must the original metal be replaced, but enough more to allow it to be rethreaded so the recut male part will fit it. It is easier to do it this way than to burn new metal on both the male and female parts, the actual size of the threaded parts not being important in this case.

To begin with, the base was chucked and the old threads bored out and a wooden ring the size of the metal to be replaced turned up to fit it easily. The base was then placed in the molding frames and rammed up as shown in Fig. 1, the wooden ring shown at E having been removed. Line cut Fig. 2 shows this mold in cross section, AA being the whistle base and BB the mold for the new metal. It will be noted that the pouring basin leading to the runner is well built up, and also that the entire mold itself is tipped so as to increase the flow of metal out of the riser and along the overflow to the sand basin built up on the floor to catch the extra brass, and which is shown in front of mold in Fig. 1. Those familiar with casting will readily see that the whole idea is to pour enough hot metal through the mold to fuse the surface of the old casting before the new metal is allowed to set. If this fusing is com-

Fig. 1.—Frame in Molding Sand.

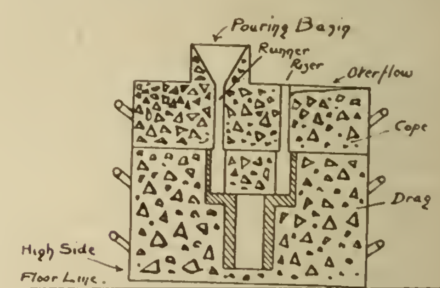


Fig. 2.—Section of Mold.

plete the repaired casting is as good as if cast that way in the first place,

Fig. 3.—Pouring the Mold.

hence the importance of having plenty of melted metal, otherwise a poor job

Fig. 4.—Complete Casting.

would result. It is far better to run through more than is absolutely necessary than not to have the fusion perfect,

Fig. 3 shows the mold being poured, the extra brass flowing out of the riser and down into the sand basin. For this job about forty or fifty pounds of melted brass was used to burn on metal weighing possibly six pounds. The extra metal is, of course, remelted and used again.

Fig. 4 shows the completed casting, with runner and riser still in place. These are sheared off and the casting is ready to be rethreaded.

At the left in Fig. 5 are shown some valve stems which are to be lengthened. Wooden pins are used for this, a hole being drilled in one end large enough to slip over the valve stem for about an inch. The valve stem and pin are then rammed in sand, the pin removed and metal run in as in the examples just shown. The valve stem is then placed in a lathe and turned to the proper size, the new part having been made large enough to true up nicely. At the right of this cut is shown an exceedingly good example of the usefulness of this method of burning on parts. the part of the big whistle marked X was broken off entirely and a new part has just been burned on and the runner (1) and the riser (2) are still in place.

Fig. 5.—Examples of Repairing by Burning.

PREVENTION OF FOUNDRY ACCIDENTS.

There is no effort more worthy of recognition and every support, than that of the prevention of accidents. The foundry, whether iron, steel, malleable or brass, is as liable to have mishaps that will maim, kill and destroy property as with other industries. There are very few, if any lines of manufacture, or commercial business that is not interested at the present day in the prevention of accidents.

The grounds for commendable achievements to prevent accidents in our foundries was so strongly urged by the writer at the American Foundrymen's Association's convention at Toronto, last June, as to result in the appointment of a committee to labor for the cause.

The cause af accidents are chargeable chiefly to: 1. Sheer carelessness. 2. Intoxicants. 3. Smoking. 4. Inattention to surroundings. 5. The improper use or disregard of safety devices. 6. Disregard of rules or orders. 7. Disrespect for consistent authority and discipline. 8. Taking chances. 9. Inferior workmanship, machinery, etc.

The knowledge of underlying causes is as essential in the question of best preventing accidents as in the remedying of defective machinery, or other industrial affairs of life.

The campaign which is being waged, and the solicitations that are being made for the support of citizens is not one merely to lessen the loss of a few lives and hundred dollars' worth of property every day as can only be done by safety devices, but one that seeks to strike at the roots of all the evils and the deplorable losses resulting from accidents.

When safety devices are put in it is often a continual combat for overseers to get employes to use them, and this is a point where there should be a special law, whereby operatives could be arrested by co-workers or employers and be heavily fined or imprisoned for not following instructions in using safety devices. Likewise where accidents are happening through the indifference of an operative to take a few extra steps or exertions, to obtain the chain or tool that was made especially for handling the job.

It is the desire to have the issue rightly tracked and state facts that should have weight with our public press and legislative bodies in passing

judgment on causes and best remedies to reduce our accidents to a minimum as far as practical.

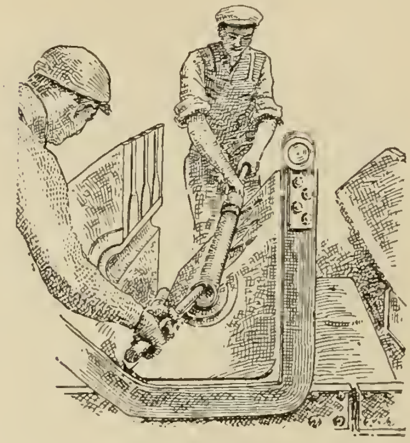
In order to obtain such data, a blank form of report has been gotten up by the committee authorized by the American Foundrymen's Association on the prevention of accidents. This blank will be circulated in the very near future among all the foundries of the United States and Canada. Among other things on which information is requested in the blank is the classification of accidents by causes cited in the third paragraph of this paper, as well as those which were unavoidable by the unfortunate sufferers; further, the expenses caused by these accidents, both direct and subsequent through repairs necessary or damaged by fire.

It is hoped that full statistics will be supplied, all of which will be kept confidential, and only the summaries used for the purpose of making a general report, which if complete enough is designed to play an important part in the legislation on accidents and other factors constantly coming up.

CASTING PIPE IN PERMANENT MOLDS.*

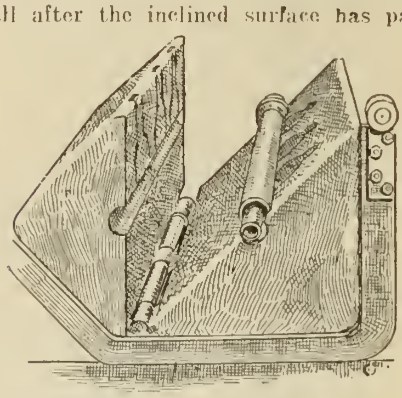
By Edgar Alan Cluster.

The machine by which it is accomplished consists of a table or ring approximately 40 feet inside diameter, carrying 30 molds, arranged at equal intervals. The table is constructed of two concentric rings of channel beams, connected with 32 cross-pieces or trucks, each of which has two wheels which run on concentric circular tracks set in concrete foundations. Under the table or ring, at two diametrically opposite points, are arranged two hydraulic cylinders, which slide in ways similar to a planing table, the pistons within the cylinder being held stationary and the cylinder being moved back and forth by the operation of a four-way valve controlling the admission of water alternately to each end of the cylinders. The stroke of the cylinders is of such

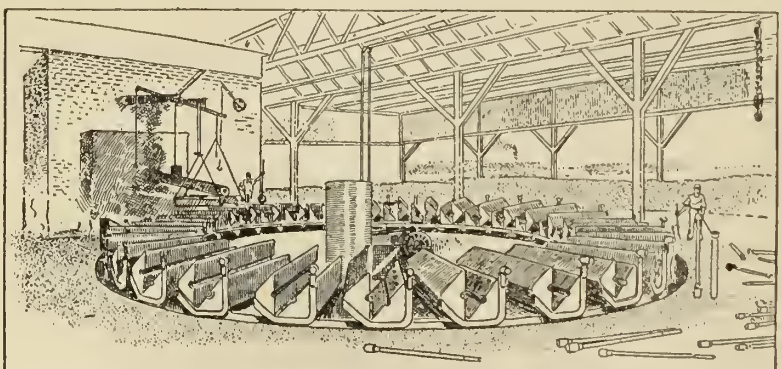


Setting Core.

length as to be slightly more than the spacing of the molds carried on the table. Projecting from the top of the cylinders is an inclined plane surface designed to lift the pins in the trucks when the cylinders move in a direction opposite to the required motion of the table and to allow a pin at each side to fall after the inclined surface has passed. In this manner each cycle of the cylinders intermittently moves the table ahead a distance equal to the spacing of the molds. The table makes one complete revolution every 7½ minutes, producing 30 pipes in that time or 240 pipes an hour.



Open Mold Showing Finished Pipe.

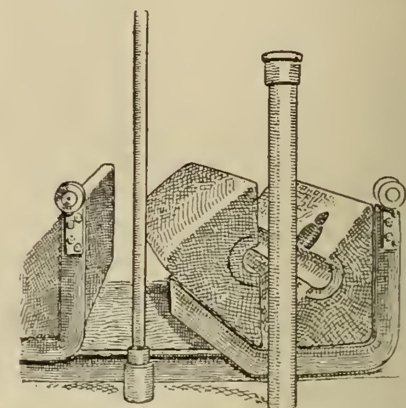


Revolving Cast Iron Molds, showing Cupola and Ladle

Continuous Pipe Carrying Casting Machine Carrying 30 Permanent Molds.

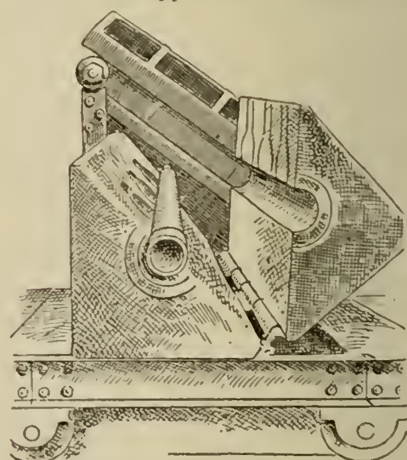
Each mold consists of a rectangular block of cast-iron 13 in. wide by 18 in. high and 6 ft. long, parted on a diagonal line across the corners, and provided with hinges at the lower edges of the parting, so as to allow the upper portion or core to be swung up and back from the lower portion or drag. The molds each weigh 6,500 lbs. complete.

Each end of the mold is provided with rings or bushings, which are used to support the core arbor in an exact central position in the cavity of the mold, so that the pipe when finished shall have uniform thickness of metal at every point. This core arbor consists of a hollow cast iron cylinder somewhat longer than the pipe to be cast and three-quarters of an inch less in diameter than the inside diameter of the pipe.



Finished Pipe and Core Arbor Mold Open.

The core is made by placing the core arbor in a machine which consists of a semi-circular support for the ends of the arbor, a shaking screen arranged to sift sand, a guide to drop it upon the arbor, and a knife. The arbor is wet thoroughly and rotated while the sand falls and clings to it. The surplus sand is scraped away by the knife, placed at the proper distance from the arbor to make the finished core of the diameter and shape required, and it is ready for use.



Mold Entering Closing Device.

* Extract of paper presented at meeting of Franklin Institute.

CANADIAN MACHINERY AND MANUFACTURING NEWS

A monthly newspaper devoted to machinery and manufacturing interests mechanical and electrical trades, the foundry, technical progress, construction and improvement, and to all users of power developed from steam, gas, electricity, compressed air and water in Canada.

The MacLean Publishing Co., Limited

JOHN BAYNE MACLEAN, President *W. L. EDMONDS, Vice-President*

H. V. TYRRELL, Toronto - - Business Manager

G. C. KEITH, M.E., B.Sc., Toronto - Managing Editor

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PARIS - Agence Havas, 8 Place de la Bourse

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ZURICH - - - Louis Wolf Orell Fussli & Co.

Cable Address:

Macpubco, Toronto. Atabek, London, Eng.

SUBSCRIPTION RATE.

Canada, United States, $1.00, Great Britain, Australia and other colonies 4s. 6d., per year; other countries, $1.50. Advertising rates on request.

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Vol. IV. NOVEMBER, 1908 No. 11.

THE NEW BRITISH PATENT LAW.

Great Britain is already feeling good effects from the new patent law, and it is given on good authority that already forty factories have been established in order to protect their interests under the new Patent Act. The Germans are rushing in and erecting factories, and already such firms as the Gillette Razor Co., Pintsch Suction Gas Co., National Cash Register Co., Clinton Wire Cloth Co., Buffalo Specialty Co. and others have bought land and are erecting factories.

The new law authorizes that "At any time not less than four years after the date of a patent, and not less than one year after the passing of this Act, any person may apply to the Controller for the revocation of the patent, on the ground that the patented article or process is manufactured or carried on exclusively or mainly outside the United Kingdom."

It is stated that nearly 2,000 patents are now within the scope of the law, and if these were all manufactured in Great Britain, 30,000 to 40,000 people would be given employment.

The law contains some weak points which will require to be remedied. One is the clause which says that in order for an article patented in Great Britain to be fully protected in that country it must be manufactured there to an "adequate extent." Whether this means the opening of a little branch somewhere and employing a few hands to make a small number of the patented articles or the investment of a large capital, must be explained. Large manufacturers may be able to erect large plants, but the smaller ones will have to quit the British markets unless they can arrange with a factory already established there for the manufacture of their articles.

Another weak point in the British Patent Law does not apply to articles not being manufactured, and if a patentee wishes to forego the practical use of an invention it will remain protected for fourteen years. As soon as the article is manufactured in another country, and not until then, does the law as stated above, apply. There does not appear to be any provision as in the Canadian law for compulsory license existing in the statute either by clauses bearing directly on the subject or by inference.

The Canadian law provides for an unworked patent:

"Any person at any time while the (unworked) patent continues to be in force may apply to the commissioner by petition for a license to make, construct, use or sell the patented invention, and the commissioner shall hear the person applying and the owner of the patent, and, if he is satisfied that the reasonable requirements of the public in reference to the invention have not been satisfied by reason of the neglect or refusal of the patentee or his legal representatives to make, construct, use or sell the invention, or to grant licenses to others on reasonable terms to make, construct, use or sell the same, may make an order requiring the owner of the patent to grant a license to the person applying therefor, in such forms and upon such terms as to the duration of the license, the amount of the royalties, security for payment, and otherwise, as the commissioner, having regard to the nature of the invention and the circumstances of the case, deems best. . . . The existence of one or more licenses shall not be a bar to an order by the commissioner for or the granting of a license on any application, under this section." The failure to grant a license after three months after the issuance of an order nullifies the patent. Thus the Canadian law makes impossible the idleness of useful ideas.

Disgruntled manufacturing nations are already talking of vengeance against the new law, and at the Trade and Patent Congress in Berlin, the delegates were of the opinion that radical measures were necessary to bring Great Britain to terms. It must be remembered, however, that all the principal manufacturing countries are either directly or indirectly accomplishing the purpose sought to be attained in the new British Patent Law. In many countries manufacture must be commenced within a stated time; and when the provisions of the laws are compared, Great Britain will be found to be much more lenient than some countries which take the matter as a personal grievance.

It is understood that steps are being taken to induce the Dominion Government to guard Canadian interests, as Canada comes within the scope of this law. We trust that the efforts will be successful.

FOR THE MANUFACTURER.

Every manufacturer should be interested in reducing the costs of his machine department. To accomplish this, several ways suggest themselves:

First—Adopt a good cost system.

Second—Educate the mechanic.

Third—Instal up-to-date machinery for the mechanic.

Frequently there appear in Canadian Machinery Cost Systems which have been found successful in manufacturing plants. In this issue is illustrated and described a Cost System which has been used in a number of factories and commended itself to the principals.

At the C.M.A. convention in Montreal and at the C.A.S.E. convention in Windsor, provision was made to study the question of the introduction of technical edu-

cation into various industries, such as has found success in farming. On that account the Fitchburg industrial course, published in this issue should be of live interest.

One thing that, perhaps, has not been given the attention it should be accorded is the instalation of up-to-date machinery. Each month the advertisers in Canadian Machinery illustrate machinery with features that must appeal to the superintendents of machine departments. Under the heading of "Machinery Development" are descriptions of machinery with new features, adapting them for certain classes of work. Do they interest you? The manufacturers of the machinery illustrated in these pages and in the advertising pages will be pleased to send you information regarding these machines. They keep up large advertising departments for the purpose of educating foremen and superintendents as to the most up-to-date methods and machinery. It certainly will pay any manufacturer to keep posted in every development of such machinery as he uses. Although at the present moment you may not require any new equipment, there is no telling when circumstances will arise which will make it necessary to get some new machinery and equipment, and get it quickly. In such a case a file of catalogues is invaluable. At the cost of a postage stamp and two minutes of a stenographer's time, occasionally, it is possible to keep informed on every development in the mechanical world.

What would one think of the doctor who failed to avail himself of every new development in medical science? Or of the lawyer who failed to keep up-to-date with new legislation and court decisions? Is it not just as vitally necessary for a manufacturer who is compelled to cope with unceasing competition to glean every bit of information about labor-saving and cost-reducing equipment which is continually being placed on the market.

All experience shows that the manufacturer who has the courage to relegate to the scrap heap all machinery that becomes in the least obsolete is the man who wins the day.

It does not follow, of course, that all new machinery is better than old, but it is the duty of any manufacturer with the least claim to progressiveness, to investigate the claims made for new machinery, and to satisfy himself whether or no he can effect a saving in his cost of production by its use.

Peruse the advertisements, the catalogue reviews, the references in the editorial columns to new equipment, and when anything interests write for it at once. The advertiser will appreciate such inquiries and you will get information of real value to you.

CANADA'S GROWING TIME.

That Canada is forging ahead cannot be doubted. We have a growing time before us. Great engineering problems are presenting themselves and everything points to a revival of trade that will surpass 1907.

J. O. Curwood, an American, writing in Putman's Monthly, says of Canada's great projects:

"This railroad building and town building in Canada are, I believe, the most wonderful and at the same time the least known of the great projects now under way in the world.

"The building of the Panama Canal; the spending of a hundred million dollars on the new Erie Canal, or any other of the present great projects of the earth is not comparable in human interest with this winning of an Empire.

"The flood of immigration will be doubled, trebled. 'A million a year,' will be the cry in 1910. Now it is under 300,000."

There is every reason to hope for big things in 1910. New G.T.P. shops are under way in Winnipeg, and new equipment has been ordered. The C.P.R. is pushing forward into the Peace River country, a railway to Hudson's Bay is being surveyed, and the double-tracking of the Intercolonial is to be considered.

New railroads are not only following settlement closely but preceding it and preparing the way by taking possession of it. The railroads are the large users of machine tools and steel, and these extensions augur well for trade in these lines. From towns east and west come news of extensions to factories and the erection of new ones. Some branches of United States companies have opened up in Canada and they are favorably impressed with the outlook. At St. Catharines, Sackville, N.B., Montreal, Winnipeg, Stratford, Peterborough, Goderich, Galt, Edmonton, Milton, Hamilton and other cities and towns new factories are going up or plants are being enlarged to meet the growing trade. All of these will require machine tools so that the prospects for the trade in the lines of shop equipment are bright.

The railroads are feeling the effects of the industrial activity, and this will mean increased orders for cars, which in turn will keep the malleable iron works and steel castings shops running to their capacity. The C.P.R. has placed an order with the Dominion Car Co., Montreal, for five hundred cars, and this is a beginning of activity in the railroad equipment shops. The Dominion Car Co. has 1,000 men at work, and from now on expect to keep the number busy.

At the Pierre Marquette shops, St. Thomas, which were constructed to take care of fifty engines a year, 150 are now being handled and increased accommodation is being talked of.

In the building returns from seventeen cities in Canada, building permits for September showed considerable improvement over the corresponding month last year. Only one city showed a decrease and that was not very great. The total gain is much greater in proportion than in the United States, where the net increase was 8.9 per cent. Taking everything into consideration, the trade outlook in Canada at the present time is very bright.

FOUNDRY ACCIDENTS.

In our reviews is mentioned a book by Thomas D. West describing the causes of accidents in factories and in our foundry department we have outlined the work undertaken by the American Foundrymen's Association for the prevention of accidents in foundries. These are worthy of perusal.

The Committee on the Prevention of Accidents in Foundries, of which L. L. Anthes, Toronto, President of the A.F.A. is a member, appointed by that association at the Toronto convention in June last, has entered upon its work. In agitating for the lessening of the number of foundry accidents, the committee desires, first of all, to obtain data from every foundryman in the United States and Canada, which will show just how much of the loss of life and property is really chargeable to unsafe shop conditions. All communications are to be considered confidential and no names will be used in the reports of the committee, but only a summary of the figures.

If the real cause of foundry accidents can be found out and made generally known it will be one big step towards their elimination.

INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News.

Machine Shop and Foundry News.

The M.C.R. is increasing its mechanical staff at St. Thomas.

The C.P.R. Angus shops are turning out 25 cars a day at present.

B. S. Spittle, machinist, Brandon, has sold his business to J. E. Watson.

The assets of the Forged Steel Car Wheel Co., Perth, are advertised for sale by tender.

Wm. Malloch & Co., London, have sold their elevator works and foundry to the Vulcan Co.

C. A. Splayford, Saskatoon, has sold his machine shop business to C. Strachan, of Winnipeg.

O. F. Phillips, Walkerville, is making inquiries relative to establishing a machine shop at Brantford.

The Gurney-Tilden Company, Hamilton, has been reorganized and has been incorporated with a capital of $800,000.

The Government bought the large Carrier Lane shops at Levis, Que. They will be used for the Public Works Dept.

The Reid Foundry and Machine Company, Ingersoll, will commence operations at their new factory in a couple of weeks.

The new factory of the Sherbrooke Machinery Co., Sherbrooke, is completed. The company is busy instaling machinery and hope to commence operations soon.

The Railway Commission has granted the application of the C.P.R. for an order allowing them to construct a branch line to the manufacturing establishment of W. J. Campbell, boilermaker, Ottawa.

H. Greenland, Orillia, has leased to J. A. McEachren, late foreman for the Galt Electrical Manufacturing Co., his machinery and part of store, lately occupied by Mr. Wallace. Mr. McEachren purposes to manufacture some lines of electrical devices.

A company has been formed at Bridgewater, N.S., with a capital of $50,000 to erect a building and manufacture marine gas engines. It is called the Acadia Gas Engine Co. The capacity of the plant will enable the company to do $50,000 worth of business per annum.

The Monarch Brass Manufacturing Company, whose brass factory at Port Colborne, Ont., was totally destroyed by fire a short while ago, will, it is believed, select Toronto for the site of the new factory, which will be rebuilt at once on a much larger scale than their former plant.

The Record Foundry & Machine Company, at Moncton, which has been only running one of their foundries since the beginning of the year, find that trade is reviving sufficiently to warrant starting the other foundry. As this company's sales agencies are scattered all over Canada, this would seem to indicate an improvement in trade conditions throughout the Dominion. They are looking forward to an increased volume of trade for the balance of the year, and are advertising for men.

The prospectus of the Canada Iron Corporation, Montreal, which is a combination of the concerns controlled by the members of the firm of Drummond, McCall & Co. and their associates shows the capital stock to be $5,000,000 common and $3,000,000 6 per cent. preferred. There are $2,500,000 6 per cent. first mortgage gold bonds, of which a London firm is offering $1,870,000. The balance is being taken by the holders of the existing bonds in the companies controlled by the corporation. These include the Canada Iron & Fdy. Co., the Canada Iron Furnace Co., John McDougall & Co., the Annapolis Iron Co. and the Londonderry Iron Co. The directors of the new corporation are, T. J. Drummond, president, G. E. Drummond, Edgar McDougall, C. C. Chipman, H. Cockshutt and George Gudwell. The London committee is composed of Sir James Heath, J. Hamilton Beum and R. W. Cooper.

News of Electrical Undertakings.

The telephone line between South Pender and ender Island has been completed.

The Hinton Electric Co., Vancouver, is instaling a $40,000 electric light plant at Kelowna, B.C.

Pincher Creek, Alta., has granted a franchise to the Pincher Creek Electric Light and Power Company.

Orillia's municipal power plant is now completed by the finishing of the new dam at Ragged Rapids.

The contract for constructing the Pipestone, Man., municipal telephone system has been secured by John Reid.

George Collison will receive a franchise and a bonus towards erecting a new electric light plant at Killarney, Man.

Strathcona city council will extend the electric power system to the Alberta Farmers' Association's grain-cleaning plant.

The contract for the construction of the Argyle municipal telephone system has been awarded to Playfair Bros., Baldur, Man.

The Northern Electric and Manufacturing Co., Montreal, has been awarded the contract for the fire alarm system for Dundas.

Nelson, B.C., is voting on a by-law to raise $85,000 for the addition of a second unit to the civic electric lighting and power plant.

The plant and franchise of the Yarmouth Telephone Co., at Yarmouth, N.S., have been sold to the Nova Scotia Telephone Co.

Glencoe, Ont., citizens, at a public meeting discussed electric light matters and pronounced in favor of establishing a municipal plant.

The rural telephone company at Delhi, Ont., is busy erecting poles on the streets, and expects to be ready for business in a short time.

The city council of St. Catharines has completed a contract with the Cataract Company for electric lights at $50 per arc light for five years.

The Ontario Power Co. is negotiating with the Westinghouse Co., of Pittsburg, for the purchase of a generator and switch board to cost $70,000.

The electric light station at Brockville, Ont., owned by the corporation of Brockville, was burned recently. Loss on buildings and machinery, $10,000.

The Lincoln Electric Light and Power Co. secured a contract from St. Catharines for light for a period of seven years, for $50 per arc lamp per year.

In connection with the Galt Electrical Manufacturing Company, the Lyons Electrical Company, of Brantford, is instaling a large generator at Burford.

Winnipeg city council has voted a further sum of $22,000 for the civic power scheme. The money will be expended on necessary work before the winter sets in.

Contracts have been made with the Hamilton Cataract Company for power for Oakville's system of electric lighting, and men are now at work instaling the new system.

The private telephone line extending from Harrow, Ont., to points in the Township of Colchester, has been connected with the lines of the Bell Telephone Company at Harrow.

The Winnipeg Street Railway Company has made an offer to the city council to furnish that city with ten thousand horse power for ten years at $18.40 per horse-power per annum.

The Yellow Grass Electric Light and Power Co. has been formed under a municipal franchise for the purpose of erecting an electric lighting and power plant for Yellow Grass, Sask.

The authorities of Glace Bay, N.S., are instaling 400 meters in connection with the municipal electric light pllant, and are also adding about three miles of transmission lines to the system.

The Bell Telephone Company have recently completed a new line out the Eramosa road, from Guelph to Everton. This will give a more direct phone service from Guelph to Erin and Orangeville.

The Barrie Light Commissioners have decided to inaugurate a 24-hour electric light service as an extension of the present half-time system. In addition power will be sold for light, manufacturing and domestic uses in units up to five horse-power.

The City Electrical Supply Co. has been formed at Wetaskiwin, Alta., by N. D. Farris and R. C. Talbot, entering into partnership. The company will handle a full line of everything required in the electrical line.

The Winnipeg city council is considering the instalation of a patrol system. The system complete it is estimated will cost $250,000, but the present requirements will call for an expenditure of only about $60,000.

At a meeting held at Simcoe, Ont., to consider the telephone service, it was the concensus of opinion that the rural telephone line should be extended without delay. A telephone company was formed and directors appointed.

The Toronto Board of Control has accepted Alex Daw's terms as consulting engineer on the electric plant—$1,200 as retainer for the first year, in advance, $100 monthly thereafter, and $50 a day for time spent there.

Arrangements are now being made to put a by-law before the ratepayers of Fernie, B. C., to provide sufficient money to rebuild and operate the Crow's Nest Electric Light & Power Company's system as a municipal enterprise.

A company is being organized at south of Estevan, Sask., to construct a rural telephone system with 11 miles of wires to be strung this fall and more added in the spring. Connection will be made with Estevan by a long-distance line.

Chatham, Ont., has finally accepted from the Colonial Engineering Co., of Montreal, the new gas producer engine for the city electric lighting plant, subject to the putting in of a new dynamo for the second-hand dynamo temporarily installed.

The Cataract Electric Light Co., is making considerable improvements to its plant at Shelburne, Ont. The tail race has been deepened, the dam repaired, and a new turbine water wheel put in position, which will materially increase the power developed.

The Kingston city light department is figuring upon the electric lighting of Portsmouth, and there is a possibility that arrangements will be made with the village council about extending the city system into the village, providing the service will pay.

Regina is considering the securing of cheaper power by the erection of a power house at the Dirt Hills, about sixty miles from the city, where there is said to be an abundant supply of excellent soft coal, and transmitting the power to the city by electric cables.

A telephone company has been formed in Cranbrook, B.C., to be known as the Kootenay Telephones, Limited, which will be capitalized at $200,000. They have purchased the Cranbrook Telephone Company's system and will operate within the boundaries of British Columbia.

The Granby Smelting Company will shortly install a new heating system at their powder thaw. Air will be heated by means of electric coils and blown by a fan into the thaw. If the new system operates satisfactorily a similar one will be installed at the Gold Drop mine.

Wynn-Meredith, the consulting hydraulic engineer, has completed a survey of the Jordan river, on Vancouver Island, for the B. C. Electric Railway, which company has made an appropriation of $1,500,000 to establish a power plant when a suitable location is fixed upon.

Consulting Engineer K. L. Aitken, Toronto, has submitted his report on Chatham's much-discussed civic gas producer lighting plant. In effect, he reports that the two-engine plant is superior in efficiency to the one-engine plant which was to be installed under the original contract.

A Yukon gold dredging company has come into possession of a volume of water power at the head of Stewart river, which it is believed can be made to yield 83,700 horse-power. This company has a dredging concession from the Canadian Government on Stewart river covering 107 miles.

The Ontario Distributing Company is about to extend its lines in Stamford Township, Ont., to the marsh winery. It is supplying 100 h.p. to the Town of Niagara for lighting and for power at the waterworks, and is furnishing private lighting. The Queen's Royal has put in about 600 lights.

R. H. Parkinson, C.E., is engaged with a party of men on the north fork of Mission Creek, B.C., in surveying a storage area and selecting a reservoir site. It is understood the

plans of the syndicate include the development of water power and the building of an electric tramway to Kelowna, B.C.

To meet the contract with the Hydro-Electric Commission the Ontario Power Co. has decided to add two units to its present plant of six units at Niagara Falls. The contract for the extension to the power house has been let to H. D. Symmes. The addition will add 25,000 horse-power to the capacity and will make a total of 95,000.

The British Columbia Electric Railway Company will this year enter upon an extensive programme of improvements in connection with the water power operating its Lake Beautiful generating plant. A large dam will be built at the mouth of Lake Coquitlam, at a cost of $250,000, and another electrical unit of 10,000 h.p. will be installed.

The tender of the Canadian Westinghouse Co. was accepted for the lighting apparatus for the streets of Prince Albert. The outfit consists of fifty arc lamps, cut outs, regulating transformers, arresters and other supplies. The contract figure was $3,154.60. Fifty 12-foot mast arms will also be purchased from the Canadian General Electric Co. at $6.80.

A building permit has been issued at Victoria to the British Columbia Electric Co. which will add a storage and battery room to its present building on Store Street. The addition, which will cost $4,000, will be fitted up with the necessary appliances for storing electricity. At present there is considerable waste of power which, with the appliances to be installed, will be conserved.

The probability is that within the near future several independent telephone lines in the rural districts about Peterboro, connecting with the Bell system, will be installed. A company has been formed in Apsley, and the work of connecting that village with Mount Julian, Stony Lake, is already under way. Meetings have been held at Zion and Stewarts, and committees have been appointed to undertake the securing of subscribers.

The agreement with the Bell Telephone Co. for the renewal of the present exclusive franchise was submitted to the Chatham, Ont., city council recently. The company offer better phones, and agree to remove the poles and instal underground conduit wires on all the main streets. Independent phone lines will be free to establish local toll stations. The underground wiring work will, if carried out, mean the expenditure of $54,000 in the city.

The Lethbridge city council has instructed Smith, Kerry & Chace, consulting engineers, Toronto, to design and construct a steam-electric generating station, which will involve the use of certain elements in the old station which has recently been purchased by the city from the Lethbridge Electric Company. The new station will be equipped with approximately 1,000 k.w. machinery, including steam water pumping unit, coal-handling apparatus, etc.

The first consignment of material for installing the new fire alarm system has arrived at Saskatoon. This consists of a number of crossarms and a quantity of galvanized wire. The arms will be attached to the electric light poles now in use. Altogether about nine miles of wire will be used and twenty alarm boxes will be placed in different parts of the city. It is expected that the new system will be in operation as soon as the new fire hall, now under construction, is completed.

A syndicate, composed of Toronto, Ottawa and Montreal interests, has been granted the privilege of developing the large water power at Raven Lake, which is some three miles south of Larder Lake. Surveys and plans are being prepared, and J. Samson Handley, of New Liskeard, has been retained as consulting engineer for the scheme. It is thought that several thousand horse-power can be generated from these falls, and the general outline of the scheme is to convert the power into electrical energy with a view of transmitting it to the various mines at Larder Lake on a high tension pole line.

Regarding the Robert contract, Mayor Payette, of Montreal, said: "I have every reason to believe that the by-law which the city council passed with the Robert Company for supplying electricity to the citizens is null and void." Mr. Robert said: "The terms of the agreement with the city in regard to a supply of electricity were such as to make it impossible for us to accept it. The mayor's declaration that the contract is null and void affects us little, as we would not sign the contract as it stood." It now means that the Montreal Light, Heat & Power Company have an absolute monopoly.

The North Bay, Ont., Light, Heat and Power Company have submitted to the council a proposition in which they ask for a 20 years' franchise, three years of which to be exclusive, and that they furnish light, while by steam power at the rate of 15 cents, and 20 per cent. off. Or should they be able to run by water power, they supply light at 15 cents, with 20 per cent. off, and a further discount of 10 per cent. if paid within 20 days, and a still further discount of 5 per cent. if paid within 10 days. A meter charge of 25 cents per month in any case. Should this proposition fail to meet with the approval of the council, the company offers to sell the plant, including the gas plant, to the town for the sum of $75,000.

Michael Chapman, chief engineer of the Gas Engine & Gas Producer Company, has completed the instalation in the Pioneer laundry at Vancouver of a 75 h.p. gas engine and gas-producing plant. The plant has been designed to drive a 50-kilowatt generator, supplied by the Canadian General Electric Company, which will be used for power purposes in the laundry. This plant is the first of its kind installed in that city. It has been so laid out that the water from the jacket of the engine and the exhaust gases will be used to provide hot water for laundry purposes, considerable ingenuity having been displayed in obtaining this end. The engine is of British make, but has been designed to operate with Canadian coal, and the producer was manufactured in the factory at Toronto. The electrical portion of the plant was supplied wholly by the Canadian General Electric Company.

Saw and Planing Mills News.

P. Boivin's sawmill at Lorette, Que., was burned.

A. D. Burrows has erected a new planing mill at Eden Mills, Ont.

Boyd Bros.' sawmill near Flesherton was burned. Loss, $1,500.

James Johnson's sawmill at Beachburg, Ont., was burned early in October.

R. Cunningham & Son's sawmill at Port Essington, B.C., has been burned.

The Carew lumber mill at Lindsay, recently burned, has started work again.

The sash and door mill of W. F. Forrest, Atwood, Ont., is for sale by tender.

The Porto Rico Lumber Co. will erect this fall a new sawmill at Nelson, B.C.

The Thompson Co's sawmill at Teeswater was burned recently. Loss about $6,000.

Larose & Larose, sash and door manufacturers, Montreal, Que., have registered.

Thos. Darling & Son's sawmill at Callendar, Ont., was damaged by fire recently.

W. E. Walsh has commenced the manufacture of sashes and doors at New Westminster.

Elwood Burtt's sawmill at Burtt's Corners, N.B., was destroyed by fire. Loss $20,000.

A new woodworking factory will be built at Campbellton, N.B., by J. & D. A. Harquail.

Mahon, MacFarlane & Mahon are putting up an up-to-date sawmill in Capilano Valley, B.C.

Hercules Boxes, Toronto, has been granted a charter to manufacture wooden and paper boxes, etc.

Limoges & Freres, manufacturers of sashes and doors, Terrebonne, Que., have been registered.

Shepard & Morse's sawmill at Hintonburg, Ont., has been damaged by fire at a loss of $1,000.

The planing mill of the Empire Lumber Co., Latchford, Ont., was burned recently. Loss about $30,000.

The Laidlaw Lumber Co.'s sawmill at Sarnia, Ont., has been damaged by fire to the extent of $6,000.

R. B. Bissett's sash and door factory at Strathcona, Alta., has been burned down at a loss of $25,000.

The Ross-Taylor Company, Exeter, Ont., has added another branch to the business, the manufacture of boxes.

J. A. Gregory's sawmill at St. John, N.B., was destroyed in a recent fire. The mill was insured for $20,000.

The Cooke Lumber Company, Nelson, B. C., has definitely decided to proceed with the erection of a saw mill.

The Sackville Woodworkers' Company, Sackville, N.B., have started work on their new factory at Sackville, N.B.

The Kennedy & Davis Milling Company, Lindsay, is enlarging its plant, and will manufacture general lines of woodenware.

Mitchell Bros.' big saw mill at Berkeley, Ont., was destroyed by fire, entailing a loss of about $8,000, with very little insurance.

The Marmora, Ont., cooperage mill has been burned down. Loss, $20,000, partly insured. Sixty men are thrown out of work.

Bristol, N.B., planing mill has resumed operations after a close-down of some weeks for repairs and the instalation of a new engine.

A loss estimated at about $3,000 was caused to the planing and saw mills of Onesime Chalifour, Quebec. The engine room was badly damaged.

Anderson's furniture factory, at Newcastle, N. B., was completely destroyed by fire. Loss estimated at $100,000, partly covered by insurance.

The factory and planing mill, owned by W. G. Gorvette, Arthur, Ont., was destroyed by fire. The loss is estimated at $6,000, partly covered by insurance.

The Nimpkish Lake Logging Company, Ltd., Vancouver, has been authorized to take over the sawmill and wood manufacturing business of Stracey & Garland.

The Malcolm Lumber Company, Fairview, B. C., has taken over the business of the Telford Lumber Company, and is fitting up a modern sawmill of 50,000 feet capacity per day.

The Kelowna Sawmill Company, capital $100,000, has been chartered to take over the business carried on under that name in Kelowna, B.C., and to manufacture wooden products.

The Elk Lumber Company, Fernie, B.C., has given orders for the cutting of 18,000,000 feet of logs this winter. This is taken as an indication that the mill will be rebuilt at an early date.

The Humber River Pulp & Lumber Company's timber limits and sawmills near Deer Lake, Newfoundland, have been sold to a syndicate headed by H. G. Bykhouse, of Grand Rapids, Mich.

A Salmon Arm, B.C., advice says that the lumbering firm of Brayden & Johnston have decided upon the erection of a mill at Canoe Creek Siding, which will be proceeded with almost immediately.

James Beveridge, St. John, N.B., who is building a pulp mill on one of the branches of the Miramichi, expects to have the plant in readiness in November. It will be fitted with the most modern machinery.

The Graham Island Lumber Company, in which two of the prominent members are C. H. Shannon, of Los Angeles, and J. C. Slean, of Pittsburg, will build a large sawmill at Massett, on Graham Island, B.C.

An Ottawa dispatch states that property has been purchased along the river front between Aylmer and Hull for the erection of a large sawmill. The estimated cost is stated to be in the neighborhood of $150,000.

The Jenkins lumber and shingle mill, Blaine, B.C., one of the largest and most modern plants in the Northwest, caught fire and was completely destroyed on Oct. 12. The loss is estimated at between $500,000 and $600,000, part of which is covered by insurance.

The Fraser River Lumber Company, of Fraser River Mills, (formerly of Millside, B.C.), have progressed rapidly with the rebuilding of their plant, which, when completed, will be without exception the largest lumber manufacturing plant in Western Canada. The daily capacity in ten hours will be 350,000 feet, or an average of 35,000 feet per hour.

A deal has been closed by James & Summerville, of Memphis, for the purchase of 200,000 acres of timber limits at Jarvis Inlet, B.C. It is probable that the investors will erect a sawmill. A sawmill will also ultimately be erected by a number of New York capitalists who have just invested $300,000 in 16,000 acres of timber limits situated on the northeast coast of Vancouver Island.

Railroad News.

The Grand Trunk Railway will make extensive improvements to its property at Cobourg.

New tenders are called for two sections on the G.T.P. between Lakes Abitibi and Nepigon.

The C.P.R. has purchased nearly a thousand acres at Sutherland, Sask., for shops and yards.

The C.P.R. steel-laying gang have now reached Wilkie, the first divisional point west of Saskatoon.

The C.P.R. roundhouse at Webbwood, Ont., was destroyed by fire recently. The total loss was $20,000.

The C.P.R. is contemplating building from Edmonton to the Lesser Slave Lake and Peace River districts.

The Canadian Northern is stated to be considering the construction of a new line between Toronto and Buffalo.

The Chicago, Milwaukee and St. Paul Railroad have decided upon the construction of a branch line into Vancouver.

The roadbed of the Esquimalt & Nanaimo Railroad is being improved and new steel structures will replace the old wooden trestles.

C.P.R. shareholders at the annual meeting on October 7 gave the directors authority to increase the capital stock from $150,000,000 to $200,000,000.

It is stated that the Niagara, St. Catharines

& Toronto Railway Company will erect a bridge over the Welland river for entrance for the line into **Welland.**

The Canadian Northern has located its line from Hawkesbury to Ottawa, and expects to be running through trains between Ottawa and Quebec **this fall.**

The Pemberton Meadows and Northern Railway have filed plans of their proposed route through British Columbia, and are negotiating for right of way.

Survey parties have located branch lines for the C.P.R. through the Pine Pass from Edmonton and from Edmonton north to Dunvegan and the Peace River.

The I.C.R. has completed arrangements for instaling in their island yard at St. John one of the latest up-to-date scales of 150 tons (300,000 pounds capacity).

R. H. Sperling, general manager, B.C. Electric Railroad Company, states that street car extensions will be constructed through Hastings upon receipt of a bonus of $51,000.

The directors of the Montreal and Southern Counties Railway expect shortly to begin the construction of the first section of the new road, which will extend from the Montreal terminus via Victoria Bridge to St. Lambert.

Johnson Bros., contractors, Brantford, have completed the grade of the Grand Trunk Pacific from Winnipeg to Portage la Prairie, and begun work on a heavy contract at Plaster Rock, on Tubuque River, in New Brunswick, which runs east 28 miles.

The Grand Trunk Railway has recently purchased ten 10-wheeled passenger locomotives from the Baldwin Locomotive Works, Philadelphia. They are what are known as the 1,000 class, which are being used on the Ottawa Division and the Montreal and Island Pond Division.

Important changes are projected in railway and marine circles at Sarnia. The C.P.R. is contemplating building from Komoka; the G.T.R. will reconstruct the Cromwell Street station, and bring trains down to the river side; and the Northern Navigation Co. will have a new steamer next year and improve the dockside arrangements.

The Grand Trunk Pacific Railway has just adopted a cut-off in Northern Caribou that will affect a saving in mileage of between one hundred and one hundred and fifty miles. The main line as now finally located, will run across the country due west from Grand Rapids, on the south fork of the Fraser, to Fort George on the main river.

A high official of the C.P.R. admits that that railway will eventually build an all-Canadian line to the Yukon. From Athabasca Landing, in Alberta, to Fort St. John across the British Columbia line, the road will proceed in a northwesterly direction until the Pine River Pass carries the road across the first range of the Rockies, and thence by the mountain passes the road will proceed northerly.

During the past summer the Grand Trunk Railway System added to its equipment the following new rolling stock: 10 ten-wheel passenger locomotives, 10 switch cylinders, 10 Simplex Mogul freight locomotives, and 20 Richmond compound consolidation freight locomotives.

The C.N.R. between Lumsden and Regina and the eight-mile stretch of new grade west of Lumsden, on which the steel has been laid, will be ballasted this fall, and the entire twenty-eight miles put in first-class shape.

A party of Grand Trunk Pacific officials, including C. M. Hays and Frank M. Morse, have gone to Prince Rupert. While in Vancouver Mr. Hays announced that tenders for the construction of 300 more miles of the railway in British Columbia would be called for within the next thirty days. The sections would be 200 miles west from Wolf River and 100 miles east of the section already under construction on the Skeena River. This will mean activity at this end, as the officials stated that construction would be rushed with as little delay as possible.

There is talk of two new railway lines into London. One through Aylmer and Belmont direct to the city. This line will be about 35 miles long and a subsidy has already been granted by the Government to the extent of $6,400 per mile of construction. The road will be run by steam. The promoters hope to commence breaking up the ground immediately after the frost goes in the spring. The estimated cost is $1,000,000. The other line is the Stratford Radial Railway, which will run from Stratford to Exeter, Hensall, St. Joseph and the shore of Lake Huron. A commencement will be made almost immediately.

Further railway activity may be noticed in the visit to the coast of Wm. Mackenzie, president of the Canadian Northern. He does not say when his line will reach the Pacific coast, but he gave it to be understood that there **would be no unnecessary delay. The construction** of this line in addition to the Granh Trunk Pacific will mean much for the interior between the present line of the C.P.R. and the more northerly of the other two, and will afford facilities for the development of some fine timber areas. In view of this, a number of deals of timber are reported. Plans have also been filed for the Howe Sound, Pemberton Meadows and Northern Railway, to run from the head of Howe Sound to Anderson Lake, tapping both mineral and timber lands.

General Manufacturing News.

The new elevator at Port Colborne is now in use.

The Crown Furniture Co., Ltd., Preston, Ont., has assigned.

J. W. Milligan, Orillia, has erected a veneer mill for manufacturing apple barrels.

The Massey-Harris warehouse at Indian Head, Sask., was destroyed by fire lately.

Detroit capitalists will develop the copper finds at Black Bay, near Port Arthur.

The Trent River Paper Co.'s plant at Frankford, Ont., was badly damaged by fire.

The Sweet Milk Condensing Co.'s factory at Laurentide, Que., was burned; loss $15,000.

A fifteen-stamp mill is to be erected at the Jewel mine, on the Boundary, near Rossland.

The British-Canadian Asbestos Co. have purchased a valuable property at East Broughton, Que.

The Anaconda group of copper claims near Ashcroft, B.C., will be developed within a short time.

The Town of Richmond, Que., is considering the question of a bonus to a furniture manufactory.

W. J. McKechnie, of Gloversville, N.Y., is negotiating for site or bonus for a factory at Regina.

E. Housey, manufacturer of gasolene launches, Toronto, sustained some loss through fire at his premises.

The B.C. Copper Co. having secured properties in the Wellington camp, will start development work at once.

The H. B. Johnston Co.'s tannery, Toronto, was destroyed by fire. Loss nearly $200,000; insurance $150,000.

The Brooklyn and Rawhide mines of the Dominion Copper Co., at Phoenix, B.C., have resumed operations.

A basket factory is in sight for Dresden, Ont. Tolmie & Graham, Cleveland, O., are making the arrangements.

A manufactory for the building of marine gasolene engines will be established at Kentville, N.S., shortly.

The Standard Soap Works, Calgary, Alta., was gutted by fire and damage to the extent of $75,000 was done.

The Atikokan Iron Co., with headquarters in Toronto and a paid-up capital of $1,000,000, has gone into liquidation.

The Stanworth-Martin Co., builders, Port Arthur, are adding to their plant and extending their new premises.

A new company has purchased the District Steam Heating Co.'s plant at Berlin and will go ahead with the project.

The Saskatchewan Flour Mills Co., Moose Jaw, will instal its own power plant. The mill will open early in November.

The Waltham-Ontario Oil Producing Company, a United States concern, has been granted a license to operate in Ontario.

The Strathcona Coal Co's plant at Moncton, N.B., was destroyed by fire. Loss estimated at $30,000, covered by insurance.

The Brantford city council are negotiating with a cement block machinery firm relative to the establishment of a factory.

Wm. McKim, Toronto, will form a $100,000 company to operate a plant for the making of gas engines at St. Catharines.

Fire destroyed the John Hill Carriage works at Bradford on Oct. 1. The loss is about $10,500, partially covered by insurance.

The Peterboro Meter Co. has taken the premises just vacated by the Collier-Cunningham Co., which has moved to larger premises.

That Vancouver will become a great mining centre is the prediction of the British mining engineers who recently visited Canada.

The reconstruction of the Standard Drain Pipe Co.'s potteries in St. John, N.B., is now accomplished and work has recommenced.

The Woods Product Co. are establishing a plant at Haliburton, Ont., for the manufacture of corona spirits, acetate of lime, charcoal, etc.

The Ansley-Pruitt Coal Mining and **Manufacturing Co. has bought the Alberta Brick Co.'s** buildings, which are being moved down to the mine.

Vancouver mining men looking for gold at Sturgeon Lake, in the Thunder Bay Country, came upon immense and valuable iron deposits.

A company is being promoted in Philadelphia to manufacture boots and shoes in Winnipeg. An option on two sites has already been secured.

A new enterprise, known as the Colonial Coal Co., of Nova Scotia, with a capital of $500,000, has been formed to operate coal areas at Little Bras d'Or, Cape Breton.

D. S. McMullen, Chatham, on behalf of an American party, has submitted a proposition to the Guelph city council relative to the establishment of a factory.

Plentiful supplies of coke have arrived and six of the Granby Company's furnaces at Grand Forks are now in commission. The seventh and eighth will be started shortly.

The Wilbur Iron Ore Co., Kingston, has gone into liquidation. The company working it was furnishing iron ore to the Lake Superior Steel Corporation at Sault Ste. Marie.

The Celtic Brick Co., Prince Albert, is having a track laid to the brick factory by the C.N. R. The company will soon be in good shape for shipping orders to outside towns.

Wm. Hazelton, a former resident of Belleville, writes from Oneonta, N.Y., offering to establish an automobile factory if a stock company can be organized with a capital of $50,000.

Lightning struck the charcoal shed of the Deseronto smelter, and inside of three hours everything except the cupola was destroyed by fire. The loss is estimated at over $100,000.

Gunn, Langlois & Co.'s cold storage plant at Montreal was damaged by fire recently to the extent of about $50,000, fully covered by insurance. The loss on the building is estimated at $15,000.

The Ellis furniture factory at Ingersoll, Ont., was recently burned down. In the same fire a large quantity of maple and pine lumber owned by Sumner & Brebner, piano manufacturers, was destroyed.

J. E. Holmes, Haliburton, Ont., inventor of the new explosive, Holmes' safety blasting compound, thinks it will be necessary to erect a large factory somewhere contiguous to an ample power supply.

The Ingersoll Nut Company has purchased the Canada Nut & Bolt Company, Niagara Falls, which has been in operation for a few months, and will remove the entire stock to Ingersoll, where the industry is located.

The directors of the American Steel & Wire Co., of Illinois, a subsidiary company of the U. S. Steel Corporation, completed the purchase of the Munroe Steel Works, at Winnipeg, and propose to erect a big plant there.

The MacGregor-Gourlay Co., Galt, has sold its north shops to F. J. Shimer & Sons, Milton, Penn., manufacturers of Shimer heads, etc., who will start a branch of their present business as soon as they get possession from the present tenants.

M. J. Aerar, president of the Northern Engineering and Supply Co., Fort William, is authority for the statement that "some of the largest implement manufacturing firms in the United States are contemplating the establishment of branches there."

The Leamington Basket Co., after several years' successful operation, is branching out into another line, having decided to manufacture handles for spades, hoes, forks and similar tools. Part of the machinery has already been installed, and the rest will be in place by the end of the year.

The Belleville Iron and Steel Company suffered a severe loss last week when the horseshoe factory in connection with the works was destroyed by fire, entailing a loss of about $6,000. With their characteristic enterprise the firm have started at once to rebuild as they have orders that will take months to fill.

Arrangements have been completed by the Stevens-Hepner Co., Port Elgin, for the purchase of the plant and patents of the Dominion Brush and Mirror Company, Toronto, which has been manufacturing a large line of hair brushes and clothes brushes. The entire plant will be removed to Port Elgin.

A. F. Nye, western manager of the Berger-Carter Co., Seattle, is now in Kamloops, in connection with the instalation of a new plant in the fruit and vegetable cannery there. With a duty of 33 per cent. on machinery, it ought to be possible to secure what is wanted in Ontario, where so many canneries are in successful operation.

John Hanbury, Brandon, Man., president of the Hanbury Manufacturing Co., who has large interests in East Kootenay and Vancouver, is in Vancouver. When the new Granville Street bridge across False Creek was being laid out,

his mill was in the way. It was taken down, and now Mr. Hanbury says he will rebuild on a nearby site, larger and better than ever.

The Maritime Railway Coal & Power Co. has accomplished a marvellous work of development at the Joggins Mines during the past season. A new slope entirely separated from the old works has been sunk to a depth of 1,800 feet, and the work of extending the levels is now proceeding rapidly. New bank-head buildings have been erected and modern machinery installed.

The Nanaimo, B.C., Gas Co., in addition to instaling a new gas engine, is spending $1,000 in improvements on the plant, calculated to greatly increase the quantity and quality of the gas. The company this week is instaling new bench retorts, one bench of sixes, with up-to-date setting and modern in every way. The company instaling the retorts guarantees 40,000 feet of gas daily.

F. A. Frazier, manager of the Oregon Spray & Gas Co., of Portland, Oregon, is looking over Vancouver for a location for a branch of his business, which he proposes to establish shortly on the Canadian side of the line. His product is used in the destruction of fruit pests, and with the growth of the fruit raising industry in British Columbia, he sees the necessity of getting close to his market.

The mayor of London is hopeful that a large English cordage company, employing in the neighborhood of 300 men, may be induced to establish a branch factory there. Wm. Gray, a traveler, has been chiefly instrumental in drawing the company's attention to London, and he will meet a representative of the concern in Toronto this week. It is understood London will be prepared to offer this company some special inducements to locate there.

The C.P.R. is constructing a new spur on the Lardo branch for the Canadian Granite and Marble Company, at Nelson, B.C. The company intends opening up an extensive quarry, and a large steam derrick is to be installed for that purpose. The business of the company is assuming large proportions, more especially at Fernie, Lethbridge, Edmonton and Regina. At the last two mentioned places large contracts with the Governments of Alberta and Saskatchewan are under consideration.

Joseph Feinbrook, Nathan, N.B, has made application to the New Brunswick Provincial Government for the lease of 137 miles of crown lands on Cain's River and Little River for the establishment of extract works for the manufacture of turpentine, rosin and other products, and the lease will be made with only a nominal rental being charged. Mr. Feinbrook has agreed to spend $100,000 or more the first year in machinery and plant, and to carry the business on for ten years at least, employing a large number of men.

At the Chignecto, N.S., mines work is brisk and times good. The construction of a railway to some point on the Northumberland Strait is now engaging the attention of the company. Such a road would bring those mines nearer to the Montreal market than any other coal areas in this province and would give the company an excellent opportunity of capturing large portions of that trade. To give an idea of the vastness of the Dominion Coal Co.'s operations in this province it is only necessary to state that the company has on its pay roll ten thousand men.

W. A. Mackay, president of the Mackay Mining Company, of North Sydney, received word that the Collins seam of coal had been discovered underlying the seam operated by the Mackay Mining Co. The outcrop of the seam was found 1,500 feet west of the site of the Mackay mine. The discovery means a great deal for the Town of North Sydney, and no doubt another colliery will be the result of this find. Considerable doubt has been expressed as to the identity of the seam worked by the Mackay Mining Co., many being of the opinion that it was the Collins seam, and the recent discovery has set at rest all doubts.

Structural Steel Construction News.

It is expected that a new structure will be erected to replace the Cockshutt bridge at Brantford.

The Winnipeg Board of Control recommend the construction of the bridge on Sargent Ave., near Empress Street.

The T. H. & B. Railway will, in the near future, erect a new overhead bridge over its tracks at Cainsville, Ont.

The Port Hope, Ont. council has accepted the tender of W. G. Gibson for the construction of a bridge on Walton Street, at a cost of $3,000.

Another bridge may be constructed across the Thames, at the foot of either Rectory or Smith Streets, London, by the owners of Riverside Park.

At a recent meeting of the Railway Commission application was made by the Winnipeg city council for the construction of eight subways.

A new bridge has been completed over the Maitland river at Dundalk, Ont., for which Corbet Bros. of Owen Sound, were the contractors.

The Owen Sound town council has awarded to J. M. Miles, Atwood, the contract for building the Union Street bridge at contract price of $8,496.

Engineers were in Smith's Falls recently making surveys of the proposed new bridge across the Rideau River, in the eastern end of that town.

The contract for the steel superstructure of the new Seymour creek bridge at Vancouver has been awarded to the M. J. Patterson Bridge Company.

T. H. Jones, city engineer, of Brantford, has recommended to the Board of Works the immediate construction of a new briuge to replace the Market Street bridge.

The contract for the construction of a costly bridge over the Old Man river, between Lethbridge and Macleod, was let by the C.P.R. to Thos. Kelly & Sons, Winnipeg.

Tenders for rebuilding the Point Wolfe bridge at Alma, N.B., will be received until Nov. 2nd by John Morrissy, Chief Commissioner, Department of Public Works, Fredericton.

The Department of Public Works, Fredericton, will receive tenders until Nov. 2 for rebuilding Silver Stream Mouth bridge, Point Wolfe bridge and River View bridge, all in New Brunswick.

City Engineer Rust, Toronto, recommends a new bridge on Winchester Street, to replace the present structure; and a new steel or concrete bridge at Crawford St., over Bellwoods Park.

Work on the Eramosa road steel bridge at Guelph is being rushed. Almost all the material needed has been shipped from the constructors, the Western Bridge and Steel Co., Chatham.

Tenders for rebuilding the Silver Stream Mouth bridge at St. Jacques, N.B., will be received until Nov. 2nd by John Morrissy, Chief Commissioner, Department of Public Works, Fredericton.

Tenders for rebuilding the River View bridge over the Pollett river at Elgin, N.B., will be received until Nov. 2nd by John Morrissy, Chief Commissioner, Department of Public Works, Fredericton.

The contract for the structural steel work of the Collegiate Institute at Reginn has been nwarded to the Dominion Bridge Company, and will all be shopped in their Winnipeg works. Wilson & Wilson are the contractors for the building, which will cost $85,000.

The B. C. Government is having plans prepnred for a structure to replace the bridge over the Elk river, which was burnt down in the recent conflagration. Plans are being drawn for a new bridge over the Elk river at Hosmer, and for the new court house in Fernie.

Trade Notes.

The Scott Machine Co., London, received a tenth order for "L. & R." test boring machines from the Department of Public Works, Ottawa.

The Dominion Steel Co. has received an order for 9,000 tons of 80.lb. steel rails from the Punjab Railway Co., of India.

The B.C. Electric Railway Company has let a contract for the construction of a launch at a cost of $8,000 to the Vancouver Shipbuilding Company.

The Sydney Foundry Co., Sydney, C.B.m has the contract for repairing the steamer Orland, which was damaged in a recent collision with the steamer Regulus.

Alex Gibb, manufacturers' agent, Montreal, has secured the Canadian agency of the S. & I. Compnny, makers of fine tools and hardware specialties, Springfield, Mass.

The new Burrell Johnson Iron Co., Yarmouth, N.S., has just laid the keel for a new steel tug which the company has contracted to build for the Dominion Government.

The Climax Road Machinery Company, Hamilton, has sold a large number of stone crushers lately, including one each to Alex Tait, of Collins' Bay, Ont., and J. McCrow, Cataraqui.

Park Bros, Chatham, have closed a contract to instal two 40,000-gallon submerged centrifugal pumps for Pelee Island Corporation, and a 50,000-gallon pump for H. Kuhlmann, on Pelee Marsh.

The Canadian Pacific Railway Co. are equipping their new boats on Kootenny Lake with Duplex outside packed plunger pumps with pot valves, being built by the Smart-Turner Machine Co., Hamilton.

The contract for the entire equipment and instalation of a new 30,000 capacity circular sawmill for the Langley Lumber Co., at Langley, Prairie, B.C., has been awarded to the Schaake Machine Works, New Westminster, B.C.

The new motor driven pump which has been ordered by the Lindsay Light, Heat and Power Co. for instalation at the waterworks, is the make of the Canada Foundry Co., and the motor is from the Canadian General Co., Peterboro. The cost of the new engine will amount to about $4,000.

Mr. Rockwell, of the Robb Engineering Company, Amherst, recently placed the machinery for the new electrical plant in the I.C.R. yard, at New Glasgow, N.S. This plant has now been completed and connections made with New Glasgow and Westville yards, which will give all the buildings and yards included in the circuit, a splendid system of lighting.

The Dominion Government has awarded the contract for the whole of the steel work at St. Andrew's locks to the Canada Fodndry Company and the Canadian General Electric Company. The contract amounts to nearly $600,000, and includes all steel work on the locks, dam and bridge, together with the steam and electrical instalations for handling the curtain locks.

The Toronto Railway Company have just placed an order with the British Insulated and Helsby Cables, Montreal, to supply and instal the three-core extra high tension feeders in connection with their new extensions. The same firm have received a contract from the B. C. Telephone Co. for over forty miles of air space telephone cables, ranging in size from 400 pair to 25 pair.

The Smart-Turner Co., Hamilton, report the following recent orders for their well-known line of pumps: Marsh & Henthorn, Belleville; a number of fog stations on Atlantic coast; two to Hamilton Bridge Works; Adams Wagon Co., Brantford; Burnlington Canning Co.; I. C. R., Moncton; Fowlers' Canndian Co., Hamilton; Coniagas Mines, Cobalt; Butler Bros. Hoop Co., Windsor; Purdy, Mansell Co., Toronto; Sudbury Court House, and Port Dover Evaporator Co.

Evidences of Industrial Revival.

The Coxheath copper mines at French Vale, C.B., will be re-opened shortly.

The Beaver and other silver mines in the Thunder Bay district are again working.

Miller's sawmill, at Pokiok, N.B., has resumed operations after a close-down of some weeks.

Abernethy & Lougheed's large sawmill at Port Haney, B.C., is reported running full capacity, with many orders ahead.

Shurly & Dietrich's saw factory and Sheldon's Limited, Galt, are both exceptionally busy and the prospects are for a busy season.

The planing mill of the Prince Albert Lumber Co. is to run night and day to cope with the rush of orders existing at present.

The Hunting Lumber Company's sawmill at Vancouver is resuming operations, extensive improvements and additions having recently been made.

The Lethbridge Iron Works have been running at full capacity all season. Large contracts are being received, among them one from the Crow's Nest Pass Coal Co., at Fernie.

It is reported that the Tuckett Tobacco Co., which withdrew its manufacturing plant from London some time ago, will shortly return to that city and resume operations there.

The sawmills on Vancouver Island are becoming more active. The Red Fir Lumber Co., of Nanaimo, has a contract to supply 900,000 feet to the C.P.R. and other mills are also receiving good orders.

T. B. Mitchell, of the Virden, Man., Machine Works, when asked if business was satisfactory, said: "Yes, we are taxed to our capacity in all departments but are managing to supply the needs of all our customers."

A report from Port Arthur says that every day now sees an additional stir in the lumbering business there. The mills from the west bring many orders for building material. The Pigeon River Lumber Co. are filling some big orders.

The marked revival in trade at Chatham, Ont., which commenced some weeks ago, still continues, and gives every promise of being permanent. Merchants in all lines report that business looks better than it has looked for years.

It is an evidence of confidence in the early revival of business at Sault Ste Marie that the Lake Superior Power Company has gone into an extensive scheme of improvements at its famous property, the Helen Iron Mine in West Algoma.

There is evidence of improvement in the industrial outlook at London, several concerns which have been running with reduced force now taking on more hands, while others that have

been having short days are extending the working hours. The prospects, as a whole, are encouraging.

"I am greatly amazed at the progress of the mining industry in British Columbia since my last western tour," said R. W. Brock in a recent interview published in the Province in Vancouver. Mr. Brock is acting director of the Dominion Geological Survey and Deputy Minister of Mines at Ottawa.

The G.T.P. has announced a tri-weekly mixed train service on the new line between Winnipeg and Watrous, Sask. From Watrous to Wainwright, Alta., the service will be bi-weekly. The whole distance covered will be 666 miles, all new territory. Many elevators have been erected along the route and a good business in grain is anticipated.

The building outlook at Chatham, Ont., continues excellent, while there is every prospect of several new industries locating there. A party of Mount Clemens business men were in the city recently, and it is pretty well understood that they were looking over the ground with a view to locating a sugar factory similar to the one in Wallaceburg.

A member of the office staff of a leading metal manufacturing concern in London reports signs already of an improvement in business in the west and he is confident that soon things will begin to hum again. As an indication of improvement in the trade situation he stated that his firm's Toronto branch had a turn-over last month equal to that of the same month last year.

The Sanderson-Harold Co., Brantford, who are large manufacturers of refrigerators, screen doors, window screens, etc., report that the outlook for their lines next season is very bright. Their factory is very busy with all departments running full time, and with the prospect of the working staff being put on overtime in about a month. Booking for the coming season's trade is expected to show a substantial increase.

Master Mechanic Montgomery states that the Pere Marquette shops at St. Thomas were never as busy as at the present time, men being taken on daily. The machine shops were built to accommodate fifty engines a year, but lately they have been forced to handle at the rate of 150, which means that if this state of things continues they would be forced to erect a substantial addition of equal dimensions to the one already built.

Both the lumbering and logging industries of the British Columbia coast are exhibiting signs of a healthy improvement, the result of an increased demand for lumber from Northwest points, says a Vancouver despatch. As an instance of how the market is improving it was stated recently by a lumberman that within the past ten days one Northwest yard has placed an order for two hundred cars of fir lumber with coast mills, half the order going to a New Westminster sawmill and the balance to a mill at Chemainus.

The William Hamilton Works, Peterboro, which have been closed down for six months on account of financial difficulties, will re-open on November 1. The building, machinery and contents had been purchased by the A. R. Williams Co., of Toronto, who were removing the machinery to their works in Toronto when negotiations were opened between it and the Collier-Cunningham Co., Peterboro. The result was that the purchase of the building, machinery and stock was closed. The name of the new company will be the William Hamilton Co., Ltd. Already it has $60,000 worth of orders to fulfill within 18 months, and prospects for continuous operations are bright. The city council, will, according to a by-law recently ratified by the Legislature, be asked for a loan of $30,000.

The amount of building going on in Vancouver is very encouraging, and nothing brings better general business. This week there are a number of large blocks to announce, although the number of residences going up suffers little diminution. The total is $96,175 for the week, a reduction of $5,000 from the previous week, and a creditable showing. The Palmer Investment Co. got a permit for a $20,000 warehouse on Westminster, and Joseph Dodson, the pioneer baker, will construct a brick block on Hastings Street to cost $45,000. Another large building is that proposed by Hon. F. Carter-Cotton, who owns the only vacant corner in the business section of the city. He will erect a seven-storey structure that will be absolutely fireproof, and it is proposed to have it ready in about a year. The Eastern Townships Bank will take the whole of the ground floor. The building will be located diagonally across Hastings Street from that to be erected by the Imperial Trust Company.

Building Notes.

A 125-barrel mill is to be erected at Aberdeen, Sask.

Jos. Dodson will erect a $45,000 bakery at Vancouver.

A. S. Arnold, Shoal Lake, Man., is erecting a 30,000-bushel elevator.

The Massey-Harris Company will erect a large warehouse at Grenfell, Sask.

The Stratford Mfg. Co., Stratford, is building an extension to its premises.

W. Ingraham, Glace Bay, may build a mattress factory at Pictou, N.S.

The Medicine Hat Milling Co. will put up a new elevator at Grassy Lake, Sask.

The Imperial Oil Co., Sarnia, will enlarge its present plant at a cost of $250,000.

The Elliott Mfg. Co. have a permit for a new factory building at Toronto.

Bannerman & Horne are erecting a large grain and hay storage house at Victoria.

The Sunbeam Incandescent Lamp Co.'s new building at Toronto will be enlarged.

Crosby & Marth have the contract for erecting a big flour mill at Aberdeen, Sask.

The Tillsonburg Packing Co. is erecting a factory at Tillsonburg to employ 30 hands.

A. McMichael will build a 25,000-bushel elevator at Beatty Siding, near Melfort, Sask.

Stuart Bros., Stratford, will enlarge their flour mills to take care of increased business.

Grafton & Co., Woodstock, Ont., will enlarge their premises by an additional storey.

A $20,000 warehouse is to be erected at Vancouver by the Palmer Land and Investment Co. J. Heighington, Wetaskiwin, Alta., will at once rebuild his laundry recently destroyed by fire.

The Alberta Pacific Elevator Co. will build three elevators at Taber, Gleichen and Killam, Alta.

The new W. A. Moore Manufacturing Company is re-modelling the old Cleland factory at Meaford.

The Montreal Ship Lining Company will build the new $17,800 workshop for the Montreal waterworks.

The Windsor Launch & Power Co. is the name of a new concern building a $10,000 plant at Windsor.

The Sackville Woodworkers' Co., Sackville, N.B., has started work on its new factory at that place.

N. Kew has the contract for the erection of a new mineral water factory for Austin Burke, at Brantford.

W. E. Staneland, Victoria, who is in the paint trade there, will erect a new factory in the near future.

Chris. Oliver, Galt, has the contract for erecting the Lowden Mfg. Co.'s new furniture factory at Guelph.

An office building and turning shop will be erected at the Canadian Spool Cotton Co.'s Works, Montreal.

Plans have been prepared for the erection of an addition to the Cockshutt Plow Co.'s warehouse at Regina.

The citizens of Vermilion, Alta., have subscribed the necessary capital for the erection of a large elevator.

Three elevators, a feed stable and a large boarding house are to be built at Keeler, Sask. J. P. Keeler is interested.

The Canadian Steel Goods Company, Hamilton, has secured a permit for the erection of a $2,500 addition to its plant.

The McLaughlin Carriage Co., Oshawa, has purchased property at Toronto, on which a large garage will be erected.

The Universal Spring Co., Sussex, N.S., intend enlarging their plant by the erection of a three-storey factory building.

The Universal Spring Company, Sussex, N.S., will enlarge its plant by the erection of a three-storey factory building.

J. Sayer has prepared plans for a stone warehouse and factory (for the estate of Victor Beaudry) at a cost of $30,000.

Lee DeLong, formerly connected with the Dupont Powder Co., Portland, Ind., will build a dynamite factory near Cobalt.

The Highland Sampling & Reduction Works is the name of a new concern that will erect a smelter near Haileybury, Ont.

Joseph Battle, Thorold, will build the new $50,000 Government dock at the Ontario Iron & Steel Co.'s plant near Welland.

The Union Stock Yards at West Toronto, recently damaged by fire to the extent of about $150,000, will be rebuilt at once.

The John King Co., will erect at Fort William a new $10,000 brick warehouse to replace the one recently destroyed by fire.

Wright & MacDonald, Vancouver, have completed plans for a bakery to cost about $30,000 and stables to cost $5,000 for Hanbury, Evans & Company.

R. T. Lowther, Oxford, Eng., and Mr. McDonald, Pictou, N.S., will erect a large cloth manufactory at Edmonton this fall.

The Tombyll Upholstering Co., Montreal, will erect a factory costing $10,000, to replace the premises destroyed by fire last winter.

The Dominion Car & Foundry Co. has re-opened, and is employing 1,000 men. The first order to be filled is 500 cars for the C.P.R.

The J. D. McArthur Co., Winnipeg, will build the new roundhouse for the Transcontinental Railway. The round-house will have 72 stalls.

The Lake Erie Grain, Milling and Elevator Company, incorporated at Guthrie, Okla., will build a 1,000-barrel flour mill at Port Colborne.

John Matthieson, Estevan, Sask., is building a new 30,000-bushel elevator, the material for which is expected on the ground within a day or so.

The Frost & Wood Co. is erecting a new warehouse at Lennoxville, Que., the former building becoming inadequate to the needs of the company.

The Raymond Mfg. Co., Guelph, Ont., have put their men on full time again, and the Standard Fitting & Valve Co. have re-opened with a full staff.

John Schadie, Magnetawan, Ont., has purchased the site of the old mill which was burned down some time ago, and will build a flour and feed mill.

The Asbestos and Asbestic Co., Danville, Que., are erecting a new factory on their property at Asbestos, which, when erected, will be the largest in Canada.

A 25-inch reach, 15½-inch gap, 10-inch cyl. Allen jaw riveter has been supplied to the American Steel Co., of Cuba, and several to Havana concerns.

John Schadie has purchased the site of the old mill at Magnetawan, Ont., which was burned down some time ago, and will build a flour and feed mill.

The Standard Cast Iron & Foundry Co., of Bristol, Pa., has been equipped with a 35-ton per hour cupola by the Whiting Foundry Equipment Co., Harvey, Ill.

The contract for the re-building of the Peterboro Cereal Company's plant at Peterboro, which was recently destroyed by fire, has been awarded to A. McIntyre.

St. Lawrence Engine Co., Brockville, are putting on an addition which will more than double the capacity of their plant. New, up-to-date equipment will be installed.

The contract for the new wholesale warehouse of the Rogers Fruit Co., Saskatoon, has been let to J. Priel, for the sum of $11,500. Excavation has been begun on the site.

Rollinger Bros., Pittsburg, Pa., have the contract for the plant to be erected at Hamilton for the People's Brewing Company. The estimated cost of buildings is $150,000.

The Christie-Brown Co., Toronto, will probably erect a biscuit factory or warehouse in Regina. The Mooney Biscuit & Candy Co., Stratford, are also likely to build a factory.

It is reported that Swift & Co., Chicago, have purchased 200 acres of land at St. Boniface on which they will erect an abattoir and lay out a stockyard, at an expenditure of over $1,000,000.

The foundation of the Taylor Milling Co.'s new elevator at Stirling, Alta., is completed and the work is being pushed forward. Work on the company's elevator at Taber will start at once.

The Estevan, Sask., Farmers' Elevator and Trading Co. has decided to erect a new 40,000-bushel elevator at once. Stromwald & Co., of Mohall, N.D., have the contract for the erection of the elevator.

S. S. Arnold, Toronto, is negotiating for a site at Walkerton on which to establish a factory for the manufacture of hinges, springs, etc. The proposed plant will give employment to from 100 to 200 hands.

The directors of the Crow's Nest Pass Coal Company will re-build the parts of their plant which were destroyed in the recent fire. It is estimated that the cost of re-building and refitting will be $50,000.

Storey & Van Egmond, Regina, are calling for tenders for a warehouse on the North Side for the New Hamburg Co. The same firm have also prepared plans for an addition to the Cockshutt Plow Co.'s warehouse.

The Canadian Pacific Railway has decided to expend $29,000 on improvements at Portage la Prairie, Man., this year. The depot and freight sheds will be remodelled, and a storage tank of 100,000 gallons capacity will be erected.

A new 125-barrel flour mill will be erected at Asquith by J. G. McLean, Winnipeg. An agree-

ment has been signed with the citizens, the people giving a bonus of $3,000, a free site and exemption from taxes for ten years.

The Standard Chain Co., of Canada, Ltd., Sarnia, Ont., for which Alexander Gibb, 13 St. John Street, Montreal, is the selling agent, have commenced to rebuild their factory and expect to have it ready for manufacturing this month.

The Farmers' Elevator & Trading Co. will pull down their old warehouse at Estevan, Sask., and have a new elevator built by Stromwald & Co., contractors, of Mohall, N.D. John Mathieson will also build another elevator in Estevan.

Prospects are good for a new flour mill at Warman, an eastern capitalist having visited the town with a view to choosing a site. Graders are busy around the C.N.R. depot putting in new side-tracks on which to accommodate wheat cars coming from Dalmeny.

The B.C. Permanent Loan & Savings Co., which has been constructing largely at Vancouver will erect a six-storey structure opposite its three-storey building just completed. It was originally intended to make this three storeys in height. The cost will be $150,000.

The Banwell-Hoxie Wire Fence Co., Hamilton, is preparing for the erection of an addition to its plant to cost $5,000. The new structure will be of concrete, and will be used for the construction of gates, a portion of the firm's business which has extensively increased within the last few years.

Two new Canadian cement manufacturing plants are being planned. The Bell's Lake Portland Cement Co., Markdale, will erect a cement mill at Walter's Creek, Ont., to have a capacity of one thousand barrels per day. The other plant is to be established at St. Mary's, Ont., by the Brant Portland Cement Company. It will have an initial daily capacity of eight hundred barrels.

The work of extending the Yorkton, Man., gas works has begun. A brick addition to the present building is being constructed and inside this a gasometer with a capacity of 1,400 cubic feet will be built at a total cost of $7,000. The plant now has a gasometer with a capacity of 1,125 cubic feet, but owing to the great demand for gas it was found necessary to increase the capacity. The company's total capacity will now be 2,525 cubic feet and this can be generated as often as it is found necessary.

Companies Incorporated.

The Phoenix Oil and Gas Company, Milverton, Ont.; capital, $100,000 ; to produce petroleum, gas and minerals. Provisional directors, J. Torrance, R. Miller and R. Lederman, all of Milverton.

The Hoop Spring Cushion Tire Co., Toronto; capital, $150,000 ; to manufacture wheels and tires for automobiles, bicycles, machinery and carriages. Provisional directors, C. Hodgson, Mary A. Hodgson and A. H. Britton.

The Ingersoll Nut Co., Ingersoll ; capital, $100,000 ; to manufacture and deal in all kinds of metals. Provisional directors, J. L. Ross, A. W. Holmstead, T. A. Silverthorn, Mary G Carrall and F. H. Potts, all of Toronto.

Halton Oil & Gas Co., Milton ; capital, $40,000 ; to treat ores, metals and minerals. Provisional directors, J. H. Shields, W. G. Young, A. E. Guidal, S. E. Brandon, P. S. Kennedy, N. McLaughlin and M. Crewson, all of Milton.

The Acme Stamping & Tool Works, Hamilton ; capital, $40,000 ; to manufacture and sell hardware, sheet metals, screws, tools and machines. Provisional directors, E. P. Bowman, T. H. Barnard and D'A. Quick, all of Hamilton.

The Smith's Falls Pressed Brick Co., Smith's Falls ; capital, $75,000 ; to manufacture pressed and other kinds of brick. Provisional directors, H. S. Hunter, C. W. McBride, H. F. Smith, A. Stevens, Smith's Falls, and D. Ewing, Cobourg.

The Holmes Safety Blasting Compound Co., Toronto ; capital, $200,000 ; to manufacture explosives. Provisional directors, J. E. Holmes, R. Cain, W. J. Hodgins, H. Brohm, Haliburton, Ont., and R. L. Cowan, and R. E. Southby, Toronto.

The American Electric Furnace Co., Niagara Falls ; capital, $50,000 ; to manufacture and deal in electric and other furnaces. Provisional directors, T. Rowlands, W. H. McGuire, F. W. Griffiths, A. J. Johnston and C. S. Peaslee, all of Niagara Falls.

The Canadian Lead Mining & Smelting Co., Kingston ; capital, $100,000 ; to crush, treat and smelt ores, metals and minerals. Provisional directors, W. G. Parmelee, Ottawa ; R. Crawford, G. A. McGowan, L. L. Henderson and E. J. B. Pense, Kingston.

The Sanitary Heating Co., Toronto ; capital, $300,000 ; to carry on iron foundry business and engage in plumbing and gasfitting. Provisional directors, A. D. Watson, M. J. O'Keefe, J. W. Gerell, A. E. Henderson, J. Hales and J. Kynoch, all of Toronto.

The Corrugated Pipe Co., Stratford ; capital, $25,000 ; to make and sell corrugated pipe. Provisional directors, W. Dawson, W. H. Burgess, T. J. Moore, M. M. Stone, E. Proctor, F. J. Benedict, T. E. Dawson, Sandusky, Mich., and E. Ball, Alpena, Mich.

The Canadian Barrel Handle and Veneer Co., Toronto ; capital, $50,000 ; to manufacture lumber and veneer, handles and a collapsible barrel and cheese box. Provisional directors, M. Armstrong, H. J. Armstrong, J. B. McKinnon, J. G. Climo and W. E. Lount.

The United Oil Fields, Toronto ; capital, $100,000 ; to take over and operate the plant of the Amalgamated Petroleum Producers. Provisional directors, W. H. Cooper, L. K. Cameron, G. P. Sylvester, J. F. Lennox, Toronto; W. Alfred, Belleville, and C. W. Belton and C. Brown, London.

Oxford Oil & Gas Co., Brantford ; capital, $250,000 ; to carry on the gas and production business of J. R. Howey at Innerkip, and to manufacture gas, oil and petroleum. Provisional directors, J. R. Howey, A. L. McPherson, J. Young, R. McIntosh and W. T. McMullen, all of Brantford.

The Fleming Grate Bar Co., Ottawa; capital, $40,000 ; to manufacture grate bars, furnaces, boilers and machinery. Provisional directors, H. W. Chamberlain, J. R. Gardner, A. F. Chamberlain, J. B. Fraser, Ottawa, and J. M. Fleming, Iroquois.

The Holmes Gas Co., Selkirk, Ont.; capital, $40,000 ; to construct and operate works for the production and sale of light, heat, power and oil. Provisional directors, J. W. Holmes, W. C. Holmes, O. B. Holmes, E. R. Holmes, Selkirk ; J. W. Holmes, Jarvis, and C. W. Holmes, Ohsweken.

Industrial Activity in the East.

One department of trade that is looking up well is building. Throughout Halifax and the entire Province of Nova Scotia there is a lot of building going on and this helps to make up in some measure for the dullness in other lines.

The Dominion Iron & Steel Co.'s billet mill, which had been closed down for some time, has again commenced operations, and the rod mill which has been idle for several days owing to the lack of billets, is again in operation The employes of the rail finishing mill have been put on tonnage instead of days pay as heretofore. The Bessemer plant has been giving more or less trouble during the past two months and has been down the greater part of the time. However, it is expected that the improvements and repairs recently made will put the plant in active operation again in the near future.

The Dominion Iron and Steel Company, of Sydney, have just commenced an order for nine thousand tons of 80-pound steel rails for the Southern Punjab Railway Company, and are to be used on the road at Conractie, India In view of the fact, the steel company had to compete with the best steel makers in the world it must be gratifying to the management that their concern could do so favorably. The shipments from Sydney will go to India via the Suez Canal.

Broughton, C.B., is again the scene of great activity. Since the closing down of the Cape Breton Coal, Iron and Railway Company a few years ago, the Dominion Coal Company have been busily engaged in boring operations, with the result that two seams of excellent coal five and six feet in thickness, have been discovered underlying the areas of the former concern. This was followed by the reorganization of the Cape Breton Coal, Iron and Railway Company, and according to report from well informed circles, Broughton will again be the Mecca of hundreds of toilers.

W. S. Fisher, of Emerson & Fisher, St. John, and president of the Enterprise Foundry Co., of Sackville, N.B., and his son, who is superintendent of the foundry, are spending a few weeks looking over the principal stove foundries in Canada and the U. S. with a view to equipping their new foundry, now under construction, as one of the most modern and efficient stove plants in Canada, and intend sparing no expense in making it thoroughly up to date.

The plan they are adopting is a series of one storey buildings, substantially constructed of brick, with concrete floors throughout. This plan is that which is being adopted by so many manufacturers during the past few years, and is one that minimizes labor to the fullest extent.

Mr. Fisher, when asked if they had considered the question of establishing their works further west, said that they had thought a good deal about this matter and after careful consideration had decided to rebuild on the old site. "I am a strong believer in the future of the Maritime Provinces as a manufacturing district," said Mr. Fisher. "For one thing, the great coal fields of Nova Scotia, which have only just begun to be developed, afford an ample supply of fuel, which, as time goes on, should be produced and sold at a lower price than at any other point in Canada. Again, the nearness to the iron-producing centres of Londonderry and the Sydneys offer an excellent prospect for a continuous and cheap supply of iron for all time to come."

The Drummonds of Montreal have purchased an immense iron area at Bathurst, N.B., at which point they expect to develop one of the largest iron and steel industries in Canada. It is claimed that there are ten million tons of iron ore in sight at this point, and this development, added to the iron industries already existing in the Maritime Provinces are a further reason why manufacturing can be carried on successfully in that section of the Dominion.

Another reason Mr. Fisher gave for preferring the Maritime Provinces is the fact that the climate there is such that men can work in comfort every day in the year, also that the labor available is of a most intelligent character. Lumber, which is an important factor in nearly all industrial enterprises, is likewise much cheaper there than elsewhere in Canada.

Speaking of the supposed handicap that eastern manufacturers are thought to be under in competing for the western trade, he said : "The facts are that freight rates on the long haul from Maritime Provinces points to those in the west, as compared with Ontario, are very little more, and the differences much more than offset by the savings in other directions."

Mr. Fisher showed a list of upwards of one hundred prominent manufacturers in the Maritime Provinces who are now doing an extensive business in manufactured goods with Quebec, Ontario and in the Northwest. At least 75 per cent. of this growth has taken place in the last ten years and is probably the best evidence that can be given to show that the opportunity for the development of manufactures in the Maritime Provinces are beginning to be realized, and that, as time goes on, the attention of capitalists will be more and more attracted there owing to the many advantages afforded.

E. & T. Fairbanks, Ltd.

Work has begun in their new shops at Sherbrooke and the first contract to fill is one for heavy track scales for the Intercolonial. In addition to scales, brass valves will be manufactured. The present shops will employ 125 men when in full operation.

Hamilton Street Railway.

The Hamilton Street Railway Co. are erecting new barns and car shops. These will each be about 300 feet long The car department will be equipped with the latest machinery. The second storey will be devoted to the manufac

Standard Railway Equipment Co.

The American Standard Railway Equipment Co., St. Louis, have organized a Canadian company at Montreal, and have taken offices in the Sovereign Bank building. The company will exploit its pneumatic tools and freight car roofing. A factory has been started at Mile End The concern is represented here by A C Murphy and A. E. Johnson.

Metal Companies Amalgamate.

An announcement is made to the metal trade of the amalgamation of the Syracuse Smelting Works and the Montreal Copper Co., both of Montreal, into one large company under the name of the Syracuse Smelting Works of Canada. The head office will remain at Montreal, with branches at London, Eng., and Brooklyn, N.Y. The enlarged concern will deal in all manufactured and raw materials.

New Hamilton Waterworks Equipment.

The fire and water committee, Hamilton, has awarded the contracts for pumps and motors to be operated by Cataract power for the new waterworks. The John McDougall Caledonia Iron Works, Montreal, will furnish the pumps at a cost of $7,220. The Canadian Westinghouse Co., Hamilton, will supply the motors for $12,928, and J. Montgomery, Toronto, the air pressure system of pumping water to mountain residents at a cost of $6,500.

MANUFACTURERS AND MANUFACTURERS' AGENTS.

It will pay you to watch our condensed column each month. There are many money-making propositions brought to your attention here. You may find just what you are looking for.

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One insertion—25c. for 20 words ; 1c. a word for each additional word.

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Manufacturers

Have you any second-hand machinery you would like to dispose of, or are you in need of anything either new or second-hand? A condensed advertisement in these columns will put you in touch with just the party you are looking for.

READ THIS:

Barrie, July 7th, 1908

Canadian Machinery,
Toronto.

Gentlemen,—The results from the condensed advt. in your paper under heading "Machinery Wanted" were much better than I obtained from similar advts. in two of the principal daily papers. I secured just what I wanted from your paper.

Yours truly,
Harry M. Wolfenden

METALLIC PACKING.

MANUFACTURE METALLIC PACKING—On receipt of three dollars we will send printed illustrated formula for making Plastic Metallic Packing for steam, water, air, gas, hydraulic machines, valves, etc. Address, Ideal Metallic Packing Co., South Still water, Minn., U.S.A. [12]

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WANTED in every town of 2000 or over, a representative to take charge of the circulation of our various publications: — Hardware and Metal, Canadian Grocer, Financial Post, Plumber and Steamfitter, Dry Goods Review, Printer and Publisher, Bookseller and Stationer, Canadian Machinery, and Busy Man's Magazine. Good financial standing and business connection a strong recommendation. A permanent position for the right man. The MacLean Publishing Company, Limited, Toronto.

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88 Fleet Street, - LONDON

B.C. a Good Steel Manufacturing District.

J. T. Shadforth, organizer of the Northern Iron & Steel Corporation, Vancouver, states that he has been asked by the Mexican Government to proceed to Mexico City to consult with them regarding the establishment of a steel plant in the republic, primarily intended for the manufacture of ordinance. He has only recently returned from Mexico, but he says he is convinced that, while lower California would be the only possible competitor that British Columbia would have in the matter of steel manufacture, this province had coal advantages. Mr. Shadforth is anxious to locate a plant in British Columbia.

G.T.P. Winnipeg Shops.

Tenders have been opened by the National Transcontinental Railway Commission for the construction of carshops, round-houses, etc., at the Winnipeg terminals. Four tenders were received for the complete works, with several other tenders for heating plant, etc. The successful tenderers will not be announced for a week or so yet, pending the examination of each tender by the commission's engineers.

The contractors now at work on the various sections of the road under contract all report good progress made during the past summer. Active construction work will be continued all winter, thus providing employment for thousands of men.

Canadian Stone in U.S. Cities.

While Vancouver is importing Oamaru stone from New Zealand, contractors in American cities on the Pacific coast are securing stone from British Columbia for building purposes. The San Francisco mint and other prominent buildings in that city were constructed of stone quarried at Newcastle Island, near Nanaimo, and now the property there has been taken over by the Newcastle Quarry Co., which will have its headquarters in Tacoma. Among these interested are W. D. Prideaux, Berkeley, Cal., president; Percy Sinclair, Tacoma, secretary, and Mr. Ward, manager. New machinery will be put in. Already several good contracts have been landed in Seattle, Tacoma and other places.

A Fireproof City.

A noteworthy feature in the rebuilding of Fernie, which is making remarkable progress, is that the city will be practically fireproof, particularly in the business portion. Structures of cement, brick and stone are taking the place of the former wooden buildings. The substantiality of cement, even against the destructive fire that took place there last summer, was amply demonstrated, and people were able to see with their own eyes what this kind of construction would stand. Building is very brisk, and the confidence of the people there is shown in the splendid buildings that are being erected, such as the new Hotel Fernie, which will be constructed of cement and stone at a cost of $40,000.

New Ontario Smelter.

The works of the Montreal Reduction & Smelting Co., at Trout Lake, Ont., 100 miles south of Cobalt, are now about ready to be put in operation. It is two years since the corner stone was laid by the Ontario Minister of Lands, Forests and Mines. The plant is for the exhaustive treatment of ores and matte containing gold, silver, cobalt, zinc, tin, copper, lead, bismuth, antimony, nickel, etc. Eight smelting furnaces and two large roasters are installed. Twelve different processes are provided for. Of the machinery installed, 175 tons was made in Canadian workshops, and 500 tons was imported. The situation is admirable for receiving and shipping purposes, as the works are on three railroads. G. W. Wallace, Detroit, Mich., is president of the company; George R. Adams, Bar Harbor, Me., vice-president; Colonel T. H. Rogers, Detroit; John Stein and C. L. Towly, Duluth, are directors. With these are associated Montreal men of capital.

Revival in B.C. Lumber Industry.

The opening of the improved mill of the Fraser River sawmills, at Millside, will mean much business to New Westminster people. The plant is described as the largest in the world, and since the transfer of interests took place about a year ago improvements have been going on. The old machinery was torn out and the latest installed. About 1,000 men will be employed. The new owners are principally Americans. Another mill is planned for Alert Bay, at the northern end of Vancouver Island, by the W. H. White Company, of Michigan. The success of the sawmills means much for the foundries and iron industries of the province, and the direct effect of their operation was seen last winter. When the sawmills were inactive, little was done in the iron and foundry works, and the resumption of operations will bring increased business all round.

New York capitalists have purchased 16,000 acres of cedar timber limits on the northeast side of Vancouver Island for $300,000. They will establish a logging camp this fall, and may erect a sawmill. Another lumber deal was that of James & Somerville, of Memphis, Tenn., who have purchased three tracts aggregating 20,000 acres between Jervis Inlet and Grief Point. The deal aggregates about $400,000.

One of the largest timber deals yet put through in Grand Forks, B.C., has just been closed. E. B. Dennison and George Mayer, two Chicago capitalists, accompanied by T. H. Rea, examined some timber limits up the North Fork of Kettle River, and were more than satisfied with their inspection, their estimate being that the limits would run 75,000 feet of lumber to the acre. The claims were bought by the Chicago capitalists for $8,000 cash. It is the intention of the new owners to form a stock company and to erect a mill on Smelter Lake, operations to commence at once. About 125 men in all will be employed at the mill and in the timber. The mill is to have a daily capacity of 100,000 feet of lumber, and will be operated by steam power.

Soo Works Output.

The Algoma Steel Co.'s output was 135,852 tons of pig iron and 142,958 tons of standard steel rails. This was the output for nine months.

During the past year the Lake Superior Steel & Iron Co., Ltd., produced 31,773 tons of open hearth steel from which were rolled 25,321 tons of open hearth rails, with earnings for year $51,243.

The Lake Superior Power Co. recorded a surplus for years of $265,943.

The Sault Ste. Marie Pulp & Paper Company output for the year was 26,248 tons against 23,001 in previous year. The net earnings of the Algoma Central and Hudson Bay Railway Co. show substantial increase over the previous year. Negotiations are now in progress to extend this road to the Canadian Pacific Railway and the National Transcontinental Railway.

CATALOGUES.

Any manufacturer will be pleased to send these catalogues if you mention Canadian Machinery.

DILL DRIVE—Pamphlet from T. C. Dill Machine Co., Philadelphia, Pa., describing the Dill system of driver.

VERTICAL BORING AND TURNING MILLS—Leaflet describing 50-in., 60-in., 64-in. and 72-in. sizes, from Gisholt Machine Co., Madison, Wis.

PUMPING ENGINES—Bulletin 1611 from Allis-Chalmers-Bullock, Montreal, describing the complete equipment of the Chicago Sewerage Pumping Station.

DRILLS—Catalogue and price list No. 4 of high speed drills, made from flat bar stock from Hackett High Speed Drill Co., 90 West Street, New York City.

D. C. MOTOR—Circular 1138 from Canadian Westinghouse, Hamilton, describing and illustrating the construction and application of their A. C. motors.

CALENDAR—From Stephenson Mfg. Co., Albany, N.Y. This company is issuing a very popular series of pretty girl calendars, one of which will be mailed monthly, on request.

SMOOTH-ON—From Smooth-On Mfg. Co., Jersey City, N.J., instruction book No. 7, describing the different Smooth-On specialties and a number of new ones, Smooth-On Iron Cement, Tape, Packing, etc.

REACTIONS—Published quarterly by the Thermit Co., New York, and issued in Canada from their Canadian office, 103 Richmond St. W., Toronto. It gives many examples of the recent use of Thermit for welding. The feature of this number is Thermit welding of locomotive frames.

RIVETERS.—Hanna Engineering Works, 820 Elston Ave., Chicago, Ill., illustrating the Pedrick & Ayer hydro-pneumatic riveters and plain toggle American yoke riveters and pneumatic punches, which they have added to their lines. The punches vary from 15 to 100 tons pressure on the rivet die.

POWER TRANSMISSION MACHINERY — 269-page catalogue, B7, from Dodge Mfg. Co., Toronto. The lines of power transmission, elevating and conveying machinery are illustrated and described. Under power transmission, gears, right-angle drive, pulleys, hangers, etc., are described and much useful information is given, making the volume valuable to superintendent and purchasing agent.

AIR COMPRESSORS—The Canadian Rand Co., Montreal, have issued a finely gotten up catalogue of steam and power-driven air compressors of Rand design. By many illustrations and descriptions, the efficiency, economy and length of service of these compressors are pointed out, and details given of construction, which characterize the products of the company as distinctly Rand. It is apparent from this that the catalogue will be of great assistance to the purchaser and to the man in charge of the machine.

BOOK REVIEWS.

ACCIDENTS, THEIR CAUSES AND REMEDIES.—By Thomas D. West, sold by Competent Life Book Agency, Sharpsville, Pa. Price 25c.

This is a treatise of the development of care and faithfulness to aid the safeguarding of life and property. It is written in view of the many accidents in the United States, but is equally applicable to Canada. It offers many original suggestions for remedies, which, if followed, would greatly increase that care and faithfulness so necessary to prevent them.

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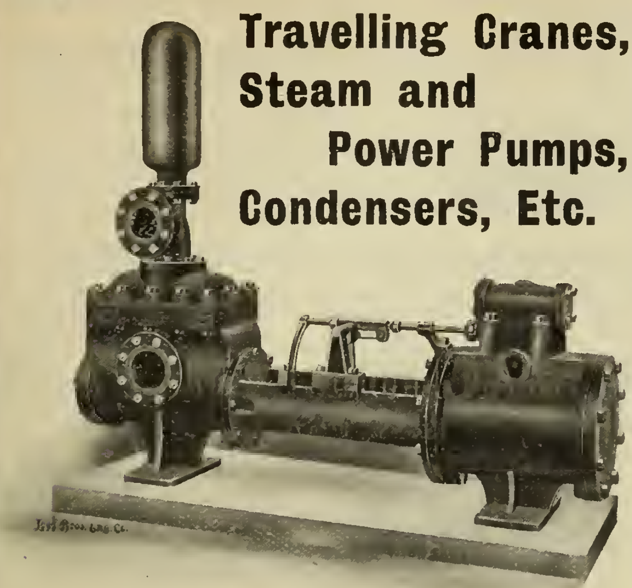

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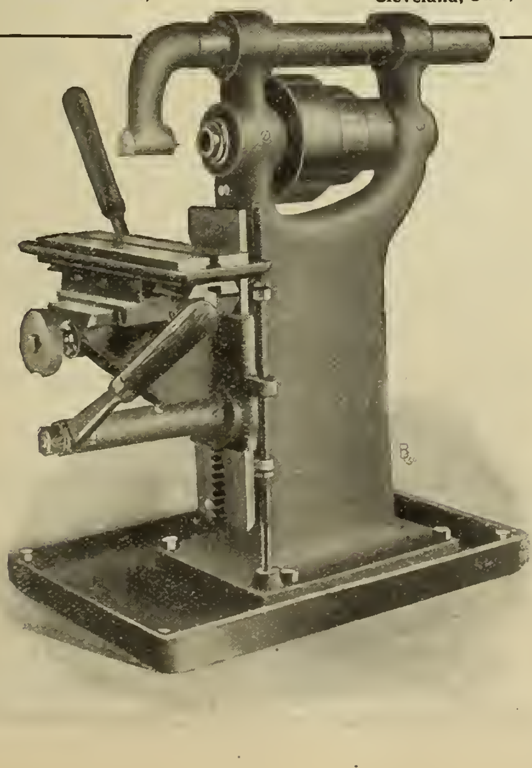

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Reid Foundry & Mach. Co., Ingersoll.
Robb Engineering Amherst, Co., N.S.
Tallman, J. N., & Sons, Hamilton
Wilson, J. C., & Co., Glenora, Ont.

Castings, Grey Iron.
Allis-Chalmers-Bullock Montreal.
Dodge Mfg. Co., Toronto
Gardner, Robt. & Son Montreal
Hall Engineering Works, Montreal.
Laurie Engine & Machine Co., Montreal.
John McDougall Caledonian Iron Works Co., Montreal,
Niagara Falls Machine & Foundry Co., Niagara Falls, Ont
Owen Sound Iron Works Co., Owen Sound.
Reid Foundry & Mach. Co., Ingersoll,
Robb Engineering Co., Amherst, N.S.
Smart-Turner Machine Co., Hamilton.
Stevens Co., Galt, Ont
Wilson, J. C., & Co., Glenora, Ont.

Castings, Phosphor Bronze.
Lumen Bearing Co., Toronto

Castings, Semi-Steel.
Reid Foundry & Mach Co., Ingersoll.
Robb Engineering Co., Amherst, N.S.

Cement Machinery.
Allis-Chalmers-Bullock, Limited, Montreal
Gardner, Robt. & Son, Montreal
Jeffrey Mfg. Co., Columbus, Ohio.
John McDougall Caledonian Iron Works, Co., Montreal
Owen Sound Iron Works Co., Owen Sound

Centreing Machines.
John Bertram & Sons Co., Dundas, Ont.
Gardner Robt. & Son, Montreal
Jeffrey Mfg Co., Columbia, Ohio
Lewis, Rice, & Son, Toronto
London Mach. Tool Co., Hamilton, Ont.
Niles-Bement-Pond Co., New York.
Pratt & Whitney Co., Hartford, Conn.

Centrifugal Pumps.
John McDougall Caledonian Iron Works Co., Montreal.
Pratt & Whitney Co., Hartford, Conn.

Chain Blocks.
Schuchardt & Schutte, New York.

Charcoal.
Detroit Foundry Supply Co., Windsor.
Dominion Foundry Supply Co., Toronto
Hamilton Facing Mill Co., Hamilton.
Hyde, Francis & Co., Montreal
Smith, J. D., Foundry Supply Co., Cleveland, Ohio
Stevens, F. B., Detroit, Mich.

Chemicals.
Canada Chemical Co., London.

Chrome Brick.
Harbison - Walker Refractories Co. Pittsburg

Chucks, Drill and Lathe.
American Tool Works Co., Cincinnati.
John Bertram & Sons Co., Dundas, Ont.
Canada Machinery Agency, Montreal.
Cleveland Twist Drill Co., Cleveland
Gardner, Robt. & Son, Montreal
Hamilton Tool Co., Hamilton, Ont.
Jacobs Mfg. Co., Hartford, Conn
Ker & Goodwin, Brantford.
London Mach. Tool Co., Hamilton.
Milroy-Harrison Co., Toronto.
National Twist Drill & Tool Co., Detroit
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.
Rice Lewis & Son, Toronto.
Standard Tool Co., Cleveland.

Chucks (Planer or Milling.)
Gardner, Robt. & Son, Montreal
Holland's Mfg. Co., Erie, Pa.

Chucking Machines.
American Tool Works Co., Cincinnati.
Lewis, Rice, & Son, Toronto
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.
Warner & Swasey Co., Cleveland, Ohio

Circuit Breakers.
Allis-Chalmers-Bullock, Limited, Montreal
Canadian General Electric Co., Toronto.
Canadian Westinghouse Co., Hamilton.
Gas & Electric Power Co., Toronto.

Cloth and Wool Dryers.
B. Greening Wire Co., Hamilton.
Sheldons Limited, Galt

Coal Boring Machines.
Cumming, J. W., New Glasgow, N.S.

Coal Handling Machinery.
Jeffrey Mfg. Co., Columbus, Ohio

Coal Miners' Tools.
Cumming J. W., New Glasgow, N.S.

Collars.
Dodge Mfg. Co., Toronto

Collectors, Pneumatic.
Sheldons Limited, Galt

Compressors, Air.
Allis-Chalmers-Bullock, Limited, Montreal
Canada Foundry Co., Limited, Toronto
Canada Machinery Agency Montreal.
Canadian Rand Co., Montreal.
Canadian Westinghouse Co., Hamilton.
Darling Bros., Ltd., Montreal
Hall Engineering Works, Montreal, Que.
H. W. Petrie, Toronto.
John McDougall, Caledonian Iron Works Co., Montreal
Monarch Eng. & Mfg. Co., Baltimore, Md.
Niles-Bement-Pond Co., New York.
The Smart-Turner Mach. Co., Hamilton.
Williams & Wilson, Montreal.

Concentrating Plant.

Allis-Chalmers-Bullock, Montreal.
Gardner, Robt. & Son, Montreal

Concrete Mixers.

Jeffrey Mfg. Co., Columbus, Ohio.

Condensers.

Canada Foundry Co., Limited, Toronto.
Canada Machinery Agency, Montreal.
Goldie & McCulloch Co., Galt.
Hall Engineering Works, Montreal.
Smart-Turner Machine Co., Hamilton.
Waterous Engine Co., Brantford.

Consulting Engineers.

Connor, A. W., Toronto
Fensom, C. J., Toronto
Hall Engineering Works, Montreal.
Jules De Clercy, Montreal.
Roderick J. Parke, Toronto.
T. Pringle & Son, Montreal.
Stewart & McTaggart, Hamilton
Taylor, James, New Glasgow, N.S.

Contractors' Plant.

Allis-Chalmers-Bullock, Montreal.
John McDougall, Caledonian Iron Works Co., Montreal.
Niagara Falls Machine & Foundry Co., Niagara Falls, Ont.

Controllers and Starters Electric Motor.

Allis-Chalmers-Bullock, Montreal.
Canadian General Electric Co., Toronto.
Canadian Westinghouse Co., Hamilton.
T. & H. Electric Co., Hamilton.

Conveyor Machinery.

Dodge Mfg. Co., Toronto
Goldie & McCulloch Co., Galt
Jeffrey Mfg. Co., Columbus, Ohio.
Laurie Engine & Machine Co., Montreal.
Rice Lewis & Son, Toronto.
John McDougall Caledonian Iron Works Co., Montreal.
Smart-Turner Machine Co., Hamilton.
Waterous Engine Works Co., Brantford.
Williams & Wilson, Montreal.
Wilson, J. C., & Co., Glenora, Ont.

Coping Machines.

John Bertram & Sons Co., Dundas, Ont.
London Mach. Tool Co., Hamilton.
Niles-Bement-Pond Co., New York.

Corundum and Corundum Wheels.

Canadian Hart Wheels Ltd., Hamilton

Core Box Machines.

Fox Machine Co., Grand Rapids.

Core Cutting-off and Coning Machine.

Falls Rivet & Machine Co., Cuyahoga Falls, Ohio.

Core Compounds.

Buffalo Foundry Supply Co., Buffalo.
Detroit Foundry Supply Co., Windsor.
Dominion Foundry Supply Co., Toronto
Hamilton Facing Mill Co., Hamilton.
Hyde, Francis & Co., Montreal
Smith, J. D., Foundry Supply Co., Cleveland, Ohio.
Stevens, F. B., Detroit, Mich.

Core-Making Machines.

Falls Rivet & Machine Co., Cuyahoga Falls, Ohio.
Hyde, Francis & Co., Montreal
Smith, J. D., Foundry Supply Co., Cleveland, Ohio
Stevens, F. B., Detroit, Mich.

Core Ovens.

Detroit Foundry Supply Co., Windsor.
Dominion Foundry Supply Co., Montreal
Falls Rivet & Machine Co., Cuyahoga Falls, Ohio.
Hamilton Facing Mill Co., Hamilton.
Hyde, Francis & Co., Montreal
Sheldons Limited, Galt
Stevens, F. B., Detroit, Mich.
Whiting Foundry Equipment Co., Harvey, Ill.

Core Prints——Standard.

Falls Rivet & Machine Co., Cuyahoga Falls, Ohio.

Core Sand Cleaners.

Sly, W. W., Mfg. Co., Cleveland

Couplings.

Dodge Mfg. Co., Toronto
Gardner, Robt. & Son, Montreal
Owen Sound Iron Works Co., Owen Sound
Wilson, J. C., & Co., Glenora, Ont.

Couplings, Air.

Canadian Rand Co., Montreal.
Independent Pneumatic Tool Co., Chicago

Cranes, Electric and Hand Power.

Canada Foundry Co., Limited, Toronto
Canadian Rand Co., Montreal.
Dominion Foundry Supply Co., Montreal
Gardner, Robt. & Son, Montreal
Hamilton Facing Mill Co., Hamilton.
John McDougall, Caledonian Iron Works Co., Montreal.
Milroy-Harrison Co., Toronto
Niles-Bement-Pond Co., New York.
Northern Engineering Works, Detroit
Owen Sound Iron Works Co., Owen Sound
Smart-Turner-Machine Co., Hamilton.
Smith, J. D., Foundry Supply Co., Cleveland, Ohio.
Whiting Foundry Equipment Co., Harvey, Ill.

Cranes, Hydraulic.

Whiting Foundry Equipment Co., Harvey, Ill.

Crank Pin Turning Machine.

London Mach. Tool Co., Hamilton.
Niles-Bement-Pond Co., New York.

Crucibles.

Detroit Foundry Supply Co., Windsor
Dominion Foundry Supply Co., Montreal
Goldschmidt Thermit Co., Toronto
Hamilton Facing Mill Co., Hamilton.
Hyde, Francis & Co., Montreal
Siedel, R. B., Inc., Philadelphia
Smith, J. D., Foundry Supply Co., Cleveland, Ohio.
Stevens, F. B., Detroit, Mich.

Crushers, Rock or Ore.

Allis-Chalmers-Bullock, Montreal.
Jeffrey Mfg. Co., Columbus, Ohio.

Cupolas.

Detroit Foundry Supply Co., Windsor
Dominion Foundry Supply Co., Montreal
De Clercy, J., Montreal
Hamilton Facing Mill Co., Hamilton.
Hyde, Francis & Co., Montreal
Northern Engineering Works, Detroit
Sheldons Limited, Galt.
Smith, J. D., Foundry Supply Co., Cleveland, Ohio.
Whiting Foundry Equipment Co. Harvey, Ill.

Cupola Blast Gauges.

Dominion Foundry Supply Co., Montreal
Sheldons Limited, Galt

Cupola Blocks.

Detroit Foundry Supply Co., Detroit.
Dominion Foundry Supply Co., Toronto
Hamilton Facing Mill Co., Hamilton
Hyde, Francis & Co., Montreal
Northern Engineering Works Detroit
Ontario Lime Association Toronto

Cupola Blowers.

Canada Machinery Agency, Montreal.
Detroit Foundry Supply Co., Windsor
Dominion Foundry Supply Co., Toronto
Hamilton Facing Mill Co., Hamilton.
Hyde, Francis & Co., Montreal
Northern Engineering Works, Detroit
Sheldon's Limited, Galt.

Cupola Linings.

Maurer, Henry, & Son, New York.
Stevens, F. B., Detroit, Mich.

Cutters, Flue.

Independent Pneumatic Tool Co., Chicago Ill.

Cutters, Gear.

Milroy-Harrison Co., Toronto.

Cutter Grinder Attachment

Cincinnati Milling Machine Co., Cincinnati

Cutter Grinders.

Cincinnati Milling Machine Co., Cincinnati

Cutters, Milling.

Abbott, Wm., Montreal
Becker Milling Machine Co., Hyde Park, Mass.
Cleveland Twist Drill Co., Cleveland
Hamilton Tool Co., Hamilton, Ont.
Milroy-Harrison Co., Toronto
National Twist Drill & Tool Co., Detroit
Owen Machine Tool Co., Springfield, Mass.
Pratt & Whitney Co., Hartford, Conn.
Standard Tool Co., Cleveland.

Cutting-off Machines.

Armstrong Bros., Tool Co., Chicago
John Bertram & Sons Co., Dundas, Ont.
Burke Machinery Co., Cleveland, Ohio
Canada Machinery Agency, Montreal.
Rice Lewis & Son, Toronto.
London Mach. Tool Co., Hamilton.
H. W. Petrie, Toronto.
Pratt & Whitney Co., Hartford, Conn.

Cutting-off Tools.

Armstrong Bros. Tool Co., Chicago.
London Mach. Tool Co., Hamilton.
H. W. Petrie, Toronto.
Pratt & Whitney, Hartford, Conn.
Rice Lewis & Son, Toronto.
L. S. Starrett Co., Athol, Mass.

Damper Regulators.

Darling Bros., Ltd., Montreal

Dies.

Acme Stamping & Tool Co., Hamilton
Armstrong Bros., Toronto
Banfield, W. H. & Son, Toronto
Bliss, E. W., Co., Brooklyn, N.Y.
Ferracute Machine Co., Bridgeton, N.J.
Gardner, Robt. & Son, Montreal
Cleal, Joseph P., Toronto
Hall J. H., & Sons, Brantford
Hall, Jas. B., Toronto
Scott, Ernest, Montreal.
Standard Contracting Co., Toronto.
Stevens Co., Galt

Die-Making Machinery.

Stevens Co., Galt, Ont.

Die Stocks.

Canadian Tap & Die Co., Galt
Curtis & Curtis Co., Bridgeport, Conn.
Jardine, A. B., & Co., Hespeler, Ont.
Milroy-Harrison Co. Toronto.

Dies, Opening.

W. H. Banfield & Sons, Toronto
Jardine, A. B. & Co., Hespeler, Ont.
Pratt & Whitney Co., Hartford Conn.

Dies, Threading.

Canadian Tap & Die Co., Galt
Jardine, A. B., & Co., Hespeler, Ont.
Milroy-Harrison Co., Toronto.

Draft, Mechanical.

W. H. Banfield & Sons, Toronto.
Butterfield & Co., Rock Island, Que.
A. B. Jardine & Co., Hespeler
Pratt & Whitney Co., Hartford, Conn.
Sheldon's Limited, Galt.

Drawn Steel, Cold.

Union Drawn Steel Co., Hamilton.

Drilling Machines, Locomotive.

American Tool Works Co., Cincinnati.
John Bertram & Sons Co., Dundas, Ont.
Bickford Drill and Tool Co., Cincinnati.
The Canadian Fairbanks Co., Montreal.
A. B. Jardine & Co., Hespeler, Ont.
London Mach. Tool Co., Hamilton, Ont.
Lewis, Rice & Son, Toronto
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.
Williams & Wilson, Montreal

Drilling Machines, Multiple Spindle.

American Tool Works Co., Cincinnati.
John Bertram & Sons Co., Dundas, Ont.
Bickford Drill & Tool Co., Cincinnati.
Canada Machinery Agency, Montreal.
Rice Lewis & Son, Toronto.
London Mach. Tool Co., Hamilton, Ont.
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.
Williams & Wilson, Montreal.

Drilling Machines, Radial.

American Tool Works Co., Cincinnati.
Bickford Tool & Drill Co., Cincinnati.
The Canadian Fairbanks Co., Montreal.
Rice Lewis & Son, Toronto
London Mach. Tool Co., Hamilton.
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.
Williams & Wilson, Montreal.

Drilling Machines, Turret.

John Bertram & Sons Co., Dundas, Ont.
London Mach. Tool Co., Hamilton.
Niles-Bement-Pond Co., New York.

Drilling Machines, Upright.

American Tool Works Co., Cincinnati.
John Bertram & Sons Co., Dundas, Ont.
Fox Machine Co., Grand Rapids
Hamilton Tool Co., Hamilton, Ont.
A. B. Jardine & Co., Hespeler, Ont.
Rice Lewis & Son, Toronto.
London Mach. Tool Co., Hamilton.

Drilling Machines, Horizontal.

John Bertram & Sons Co., Dundas, Ont.
Canada Machinery Agency, Montreal.
Lewis, Rice & Son, Toronto.
London Mach. Tool Co., Hamilton.
Niles-Bement-Pond Co., New York.

Drills, Bench.

Hamilton Tool Co., Hamilton, Ont.
Lewis, Rice & Son, Toronto.
London Mach. Tool Co., Hamilton.
Pratt & Whitney Co., Hartford, Conn.

Drills, Blacksmith.

Canada Machinery Agency, Montreal.
A. B. Jardine & Co., Hespeler, Ont.
London Mach. Tool Co., Hamilton.
National Twist Drill & Tool Co., Detroit
Standard Tool Co., Cleveland.

Drills, Centre.

Cleveland Twist Drill Co., Cleveland
Lewis, Rice & Son, Toronto.
Milroy-Harrison Co., Toronto.
National Twist Drill & Tool Co., Detroit
Pratt & Whitney Co., Hartford, Conn.
Standard Tool Co., Cleveland, O.
L. S. Starrett Co., Athol, Mass.

Drills, Coal and Plaster.

Cumming, J. W., New Glasgow, N.S.

Drills, Electric.

Canadian Pilling Co., Montreal
Niles-Bement-Pond Co., New York.

Drills, High Speed.

Abbott, Wm., Montreal
Cleveland Twist Drill Co., Cleveland
Alexander Gibb, Montreal.
Lewis, Rice & Son, Toronto.
Lincoln-Williams Twist Drill Co., Taunton, Mass.
Milroy-Harrison Co., Toronto.
National Twist Drill & Tool Co., Detroit
Pratt & Whitney Co., Hartford, Conn.
Standard Tool Co., Cleveland, O.

Drills, Hand.

A. B. Jardine & Co., Hespeler, Ont.

Drills, Pneumatic.

Allen, John F., New York
Canada Machinery Agency, Montreal.
Canadian Rand Co., Montreal
Independent Pneumatic Tool Co., Chicago, New York
Niles-Bement-Pond Co., New York.

Drills, Ratchet.

Armstrong Bros. Tool Co., Chicago.
Cleveland Twist Drill Co., Cleveland
A. B. Jardine & Co., Hespeler,
Milroy-Harrison Co., Toronto.
National Twist Drill & Tool Co., Detroit
Pratt & Whitney Co., Hartford, Conn.
Standard Tool Co., Cleveland.

Drills, Rock.

Allis-Chalmers-Bullock, Montreal.
Canadian Rand Drill Co., Montreal.
Jeffrey Mfg Co., Columbus, Ohio.

Drills, Sensitive.

American Tool Works Co., Cincinnati.
Canada Machinery Agency, Montreal.
Fox Machine Co., Grand Rapids.
Lewis, Rice & Son, Toronto.
McKenzie, D., Guelph, Ont.
Niles-Bement-Pond Co., New York

Drills, Twist.

Abbott, Wm., Montreal.
Cleveland Twist Drill Co., Cleveland
Alex. Gibb, Montreal.
Lincoln-Williams Twist Drill Co., Taunton, Mass.
Milroy-Harrison Co., Toronto.
Morse Twist Drill and Machine Co., New Bedford, Mass.
National Twist Drill & Tool Co., Detroit
Pratt & Whitney Co., Hartford, Conn.
Standard Tool Co., Cleveland.
Whitman & Barnes Mfg. Co., St. Catharines, Ont.

Dry Kiln Cars.

Hammant Steel Car and Eng Works, Hamilton.

Dry Kiln Equipment.

Sheldons Limited, Galt

Dump Cars.

Canada Foundry Co., Limited, Toronto
Dominion Foundry Supply Co., Montreal
Hamilton Facing Mill Co., Hamilton.
Hammant Steel Car and Eng. Works, Hamilton.
Hyde, Francis & Co., Montreal
Jeffrey Mfg. Co., Columbus, Ohio
Koppel, Arthur Co., New York
John McDougall, Caledonian Iron Works Co., Montreal.
Niles-Bement-Pond Co., New York.
Owen Sound Iron Works Co., Owen Sound
Waterous Engine Co., Brantford.

Dust Arresters.

Sly, W. W., Mfg. Co., Cleveland

Dynamos.

Allis-Chalmers-Bullock, Montreal.
Canadian General Electric Co., Toronto.
Canadian Westinghouse Co., Hamilton.
Hall Engineering Works, Montreal, Que.
Lewis, Rice & Son, Toronto.
Packard Electric Co., St. Catharines.
H. W. Petrie, Toronto.
T. & H. Electric Co., Hamilton.

Electrical Books.

American Industrial Pub. Co., Bridgeport, Conn.

Electrical Pyrometers.

Thwing, C. B., Philadelphia

Electrical Supplies.

Canadian General Electric Co., Toronto.
Canadian Westinghouse Co., Hamilton.
London Mach. Tool Co., Hamilton, Ont.
Packard Electric Co., St. Catharines.
T. & H. Electric Co., Hamilton.

Elevators.

Jeffrey Mfg. Co., Columbus, Ohio
Whiting Foundry Equipment Co., Harvey, Ill.

Elevator Buckets.

Jeffrey Mfg. Co., Columbus, Ohio.

Emery and Emery Wheels.

Canadian Hart Wheels Ltd., Hamilton.
Dominion Foundry Supply Co., Montreal
Hamilton Facing Mill Co., Hamilton.
Hyde, Francis & Co., Montreal
Milroy-Harrison Co., Toronto.
Stevens, F. B., Detroit, Mich.

Emery Stands.

McKenzie, D., Guelph, Ont.

Emery Wheel Dressers.

Canadian Hart Wheels Ltd., Hamilton.
Canada Machinery Agency, Montreal.
Dominion Foundry Supply Co., Montreal
Gardner, Robt. & Son, Montreal
Hamilton Facing Mill Co., Hamilton.
Hyde, Francis & Co., Montrea
Milroy-Harri on Co., Toronto.
H. W. Petrie, Toronto.
Standard Tool Co., Cleveland.

Engineering Books.

American Industrial Pub. Co., Bridgeport, Conn.

Engineers and Contractors.

Canada Foundry Co., Limited, Toronto.
Darling Bros., Ltd., Montreal
Dynamic Machine Works, Montreal.
Goldie & McCulloch Co., Galt, Ont.
Hall Engineering Works, Montreal.
Laurie Engine & Machine Co., Montreal.
John McDougall, Caledonian Iron Works Co., Montreal.
Robb Engineering Co., Amherst, N.S.
The Smart-Turner Mach. Co., Hamilton.
Taylor, James, New Glasgow, N.S.

Engineers' Supplies.

Hall Engineering Works, Montreal.
Rice Lewis & Son, Toronto.

Engines, Gas and Gasolene.

Canada Foundry Co., Toronto.
Canada Machinery Agency, Montreal.
The Canadian Fairbanks Co., Montreal.
Goldie & McCulloch Co., Galt, Ont.
Jones & Glassco, Montreal
Milroy-Harrison Co., Toronto.
Oliver, W. H., & Co., Toronto
Rice Lewis & Son, Toronto.
H. W. Petrie, Toronto.
The Smart-Turner Mach. Co., Hamilton

Engines, Oil.

Dinning & Eckinstein, Montreal.
Jones & Glassco, Montreal

Engines, Steam.

Allis-Chalmers-Bullock, Montreal
Belliss & Marcom, Birmingham, Eng.
Canada Machinery Agency, Montreal.
The Goldie & McCulloch Co., Galt, Ont.
Rice Lewis & Son, Toronto.
Laurie Engine & Machine Co., Montreal.
John McDougall Caledonian Iron Works, Montreal.
Robb Engineering Co., Amherst, N.S.
Sheldons Limited, Galt.
The Smart-Turner Mach. Co., Hamilton.
Waterous Engine Works Co., Brantford.

Engine Lathes.

Schuchardt & Schutte, New York

Excavating Machinery.

Jeffrey Mfg. Co., Columbus, Ohio

Exhaust Heads.

Darling Bros., Ltd., Montreal.
Sheldons Limited, Galt, Ont.
Standard Engineering Co., Toronto.

Fans, Electric.

Canadian General Electric Co., Toronto
Canadian Westinghouse Co., Hamilton.
Sheldons Limited, Galt, Ont.
The Smart-Turner Mach. Co., Hamilton.

Fans, Exhaust.

Detroit Foundry Supply Co., Windsor.
Dominion Foundry Supply Co., Toronto
Hamilton Facing Mill Co., Hamilton.
Sheldons Limited, Galt.

Feed Water Heaters.

Darling Bros., Montreal
Laurie Engine & Machine Co., Montreal
John McDougall, Caledonian Iron Works Co., Montreal
The Smart-Turner Mach. Co., Hamilton

Fillers (Metallic.)

Shelton Metallic Filler Co., Derby, Conn.
Smooth-On Mfg. Co., Jersey City, N.J.
Stevens, F. B., Detroit, Mich.

Fire Brick and Clay.

Detroit Foundry Supply Co., Windsor
Dominion Foundry Supply Co., Toronto
Hyde, Francis, & Co., Montreal
Harbison-Walker Refractories Co., Pittsburg
Hayes Run Fire Brick Co., Orvis, Pa.
Maurer, Henry, & Son, New York
Hamilton Facing Mill Co., Hamilton
Ontario Lime Association, Toronto
Penn, Wm., Silica Works, Philadelphia.
Remmy, Richard C., Sons' Co., Philadelphia, Pa.
Stevens, F. B., Detroit, Mich.

Fireproofing Hollowtile.

Maurer Henry, & Son, New York

Folding Rules.

Schuchardt & Schutte, New York.

Forges.

Canada Foundry Co., Limited, Toronto.
Hamilton Facing Mill Co., Hamilton.
Independent Pneumatic Tool Co., Chicago, Ill.
Monarch Eng. Mfg. Co., Baltimore, Md.
H. W. Petrie, Toronto.
Sheldons Limited, Galt, Ont.

Forges, Oil Rivet.

Monarch Eng. & Mfg. Co., Baltimore, Md

Forgings, Drop.

Bliss, E. W., Co., Brooklyn, N.Y.
John McDougall, Caledonian Iron Works Co., Montreal.
H. W. Petrie, Toronto.
Wilson, J. C., & Co., Glenora, Ont.

Forgings, Light & Heavy.

Hamilton Steel & Iron Co., Hamilton

Forging Machinery.

John Bertram & Sons Co., Dundas, Ont.
Bliss, E. W., Co., Brooklyn, N.Y.
London Mach. Tool Co., Hamilton, Ont.
National Machinery Co., Tiffin, Ohio
Niles-Bement-Pond Co., New York.

Foundry Coke.

Baird & West, Detroit
Stevens, F. B., Detroit, Mich.

Foundry Equipment.

Detroit Foundry Supply Co., Windsor.
Dominion Foundry Supply Co., Toronto
Hamilton Facing Mill Co., Hamilton
Hyde, Francis & Co., Montreal
Northern Engineering Works, Detroit
Stevens, F. B., Detroit, Mich.
Whiting Foundry Equipment Co., Harvey, Ill.

Foundry Parting.

Doggett, Stanley, New York
Dominion Foundry Supply Co., Toronto
Foundry Specialty Co., Cincinnati.
Hyde, Francis & Co., Montreal
Partomol Co., New York
Swoboda, L. J., New York.

Foundry Facings.

Detroit Foundry Supply Co., Windsor.
Dominion Foundry Supply Co., Toronto
Hamilton Facing Mill Co., Hamilton.
Hyde, Francis & Co., Montreal
Smith, J. D., Foundry Supply Co., Cleveland, Ohio.
Stevens, F. B., Detroit, Mich.

Friction Clutches.

Dodge, Mfg. Co., Toronto

Friction Clutch Pulleys, etc

The Goldie & McCulloch Co., Galt.

Furnace Lining.

Monarch Eng. & Mfg. Co., Baltimore, Md

Furnaces.

Detroit Foundry Supply Co., Windsor.
Dominion Foundry Supply Co., Montreal
Hamilton Facing Mill Co., Hamilton.
Hyde, Francis & Co., Montreal
Monarch Eng. & Mfg. Co., Baltimore
Northern Engineering Works, Detroit
Smith, J. D., Foundry Supply Co., Cleveland, Ohio.
Stevens, F. B., Detroit, Mich.
Whiting Foundry Equipment Co., Harvey, Ill.

Furnaces, Brass.

Monarch Eng. & Mfg. Co., Baltimore, Md
Whiting Foundry Equipment Co., Harvey, Ill.

Gang Planer Tools.

Armstrong Bros. Tool Co., Chicago

Gas Blowers and Exhausters.

Sheldons Limited, Galt.

Gas Producer Plants.

Canada Foundry Co., Toronto
Gas & Electric Power Co., Toronto
Oliver, W. H., & Co., Toronto.
Jones & Glassco, Montreal
Williams & Wilson, Montreal

Gauges, Standard.

Cleveland Twist Drill Co., Cleveland
Pratt & Whitney Co., Hartford, Conn.

Gear-Cutting Machinery.

Armstrong Bros., Toronto
Becker Milling Mach. Co., Hyde Park, Mass.
Bickford Drill & Tool Co., Cincinnati.
Gould & Eberhardt, Newark, N.J.
Lewis, Rice & Son, Toronto.
London Mach. Tool Co., Hamilton.
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.
Pratt & Whitney Co., Hartford, Conn.
Schuchardt & Schutte, New York.
Williams & Wilson, Montreal.
Wilson, J. C., & Co., Glenora, Ont.

Gear Hobbing Machines.

Gould, Eberhardt & Newark, N.J.

Gears, Angle.

Boston Gear Works, Norfolk Downs, Mass.
Gardner, Robt., & Son, Montreal
Goldie & McCulloch Co., Galt, Ont.
Gould & Eberhardt, Newark, N.J.
Laurie Engine & Machine Co., Montreal.
John McDougall, Caledonian Iron Works Co., Montreal.
Waterous Engine Co., Brantford.
Wilson, J. C., & Co., Glenora, Ont.

Gears, Cut.

Boston Gear Works, Norfolk Downs, Mass
Dynamic Machine Works, Montreal
Gardner, Robt., & Son, Montreal
Goldie & McCulloch Co., Galt, Ont.
Gould & Eberhardt, Newark, N.J.
Horsburgh & Scott Co., Cleveland
New Process Raw-Hide Co., Syracuse, N.Y.
Wilson, J. C., & Co., Glenora, Ont.

Gears, Mortise.

Boston Gear Works, Norfolk Downs, Mass.
Gardner, Robt. & Son, Montreal
Goldie & McCulloch Co., Galt, Ont.
New Process Raw-Hide Co., Syracuse, N.Y.
Wilson, J. C., & Co., Glenora, Ont.

Gears, Rawhide.

Gardner, Robt., & Son, Montreal
Goldie & McCulloch Co., Galt, Ont.
Horsburgh & Scott Co., Cleveland
New Process Raw-Hide Co., Syracuse, N.Y.

Gears, Worm.

Dynamic Machine Works, Montreal.
Gardner, Robt., & Son, Montreal
Gould & Eberhardt, Newark, N.J.
Horsburgh & Scott Co., Cleveland
Wilson, J. C., & Co., Glenora, Ont.

Generators, Electric.

Allis-Chalmers-Bullock, Limited, Montreal
Canadian General Electric Co., Toronto
Canadian Westinghouse Co., Hamilton.
Gas & Electric Power Co., Toronto
Hall Engineering Works, Montreal
H. W. Petrie, Toronto.
Toronto & Hamilton Electric Co., Hamilton.

Governors, Water Wheel.

Wilson, J. C., & Co., Glenora, Ont.

Graphite.

Detroit Foundry Supply Co., Windsor.
Dominion Foundry Supply Co., Toronto
Hamilton Facing Mill Co., Hamilton.
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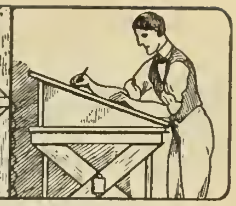

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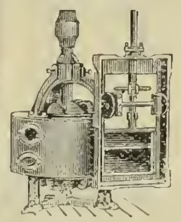

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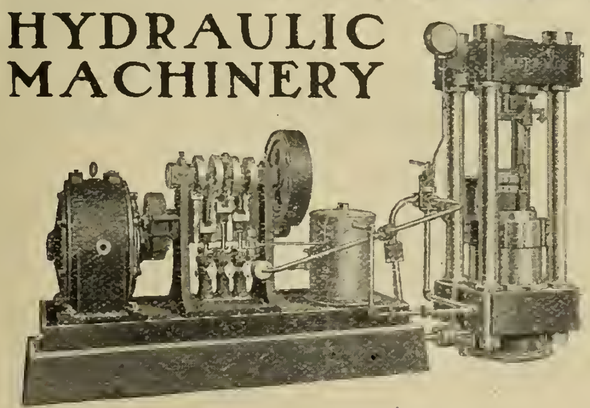

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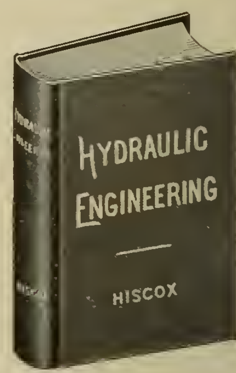

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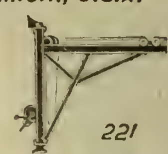

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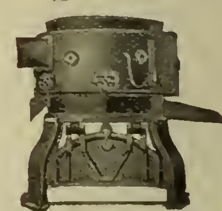

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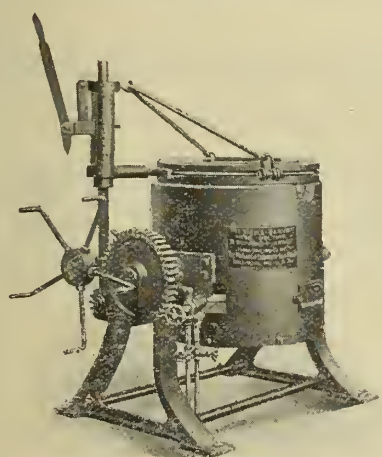

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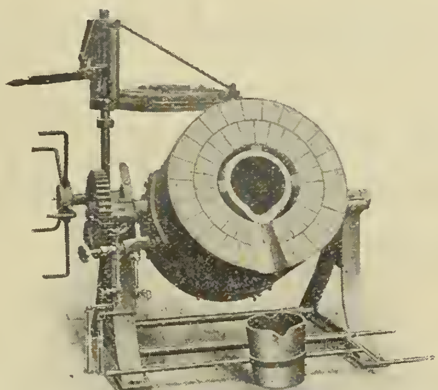

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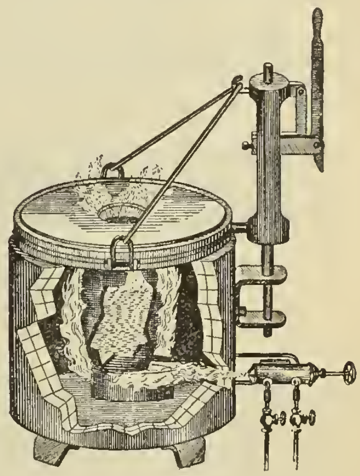

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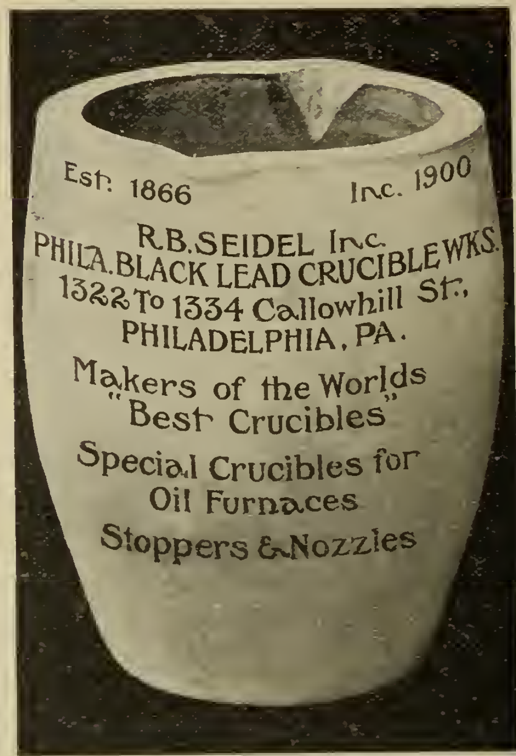

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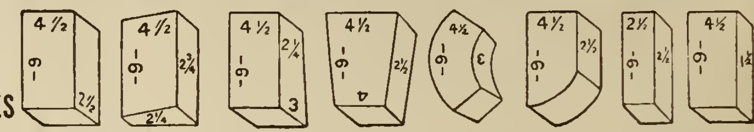

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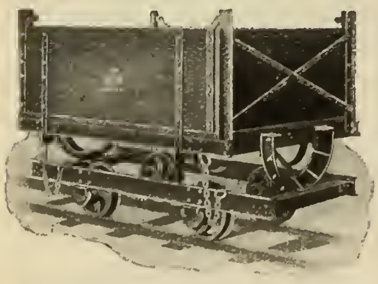

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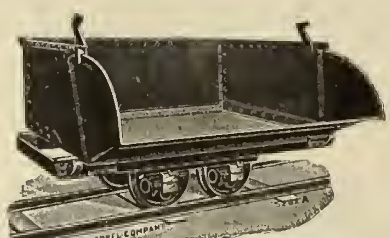

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save money in transporting materials and finished products.

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EXCELS ALL OTHERS.

12-in. Machine
Front view, showing pattern frame down

¶ This fact has been demonstrated to the absolute satisfaction of a large number of the more prominent foundrymen of the United States and Canada. The superintendent of one of the largest foundries in the United States, who has used all styles of machines, says that the "REID" is the cheapest, most rigid, and most perfect draw-down machine he ever saw.

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AUTOMATIC

MOLDING MACHINE

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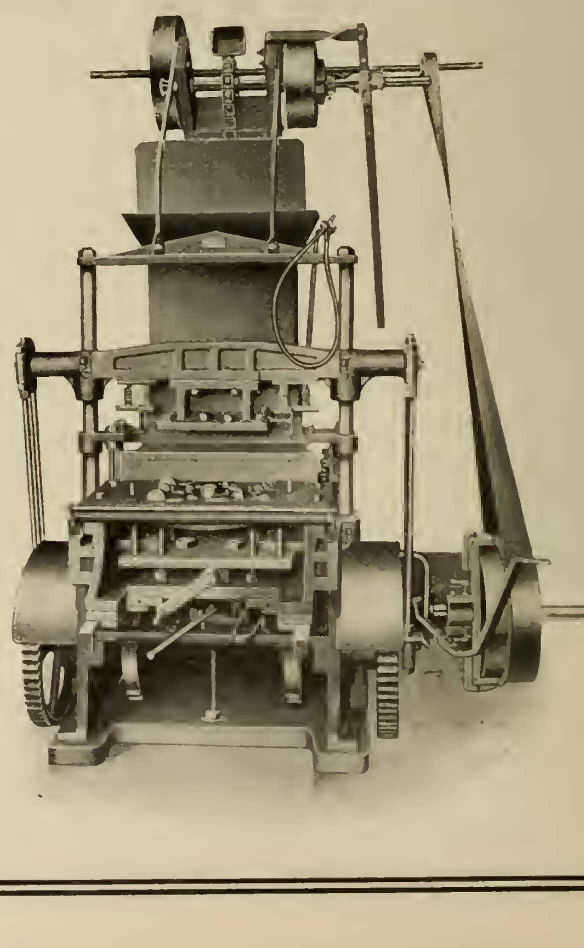

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¶ Investigate recent improvements it will pay you handsomely.

Write us about our Aluminum Snap Flasks and Rotary Riddles.

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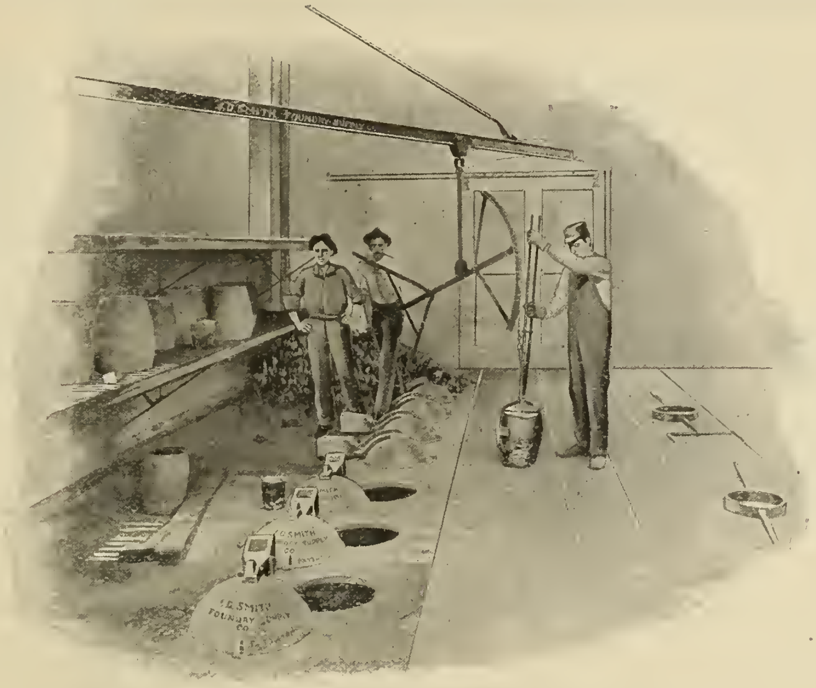

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TO USE A FILLER THAT
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Shelton Metallic Filler becomes a part of the casting itself, taking the same finish, passing every inspection. Simple and easy to use. Always to be depended on—fifteen years of success proves its superiority.

Use the old reliable Shelton Metallic Filler and your troubles and losses will dwindle as your profits increase.

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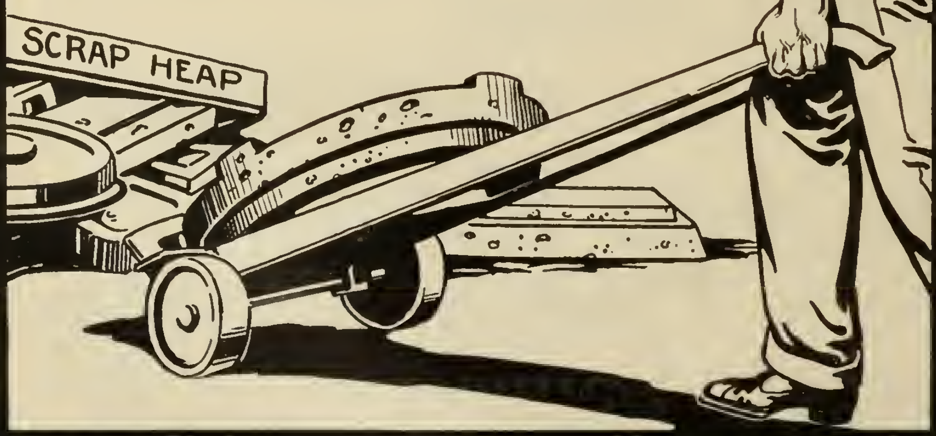

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The House of
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supply the foundry trade of the Dominion with

SHELTON METALLIC FILLER

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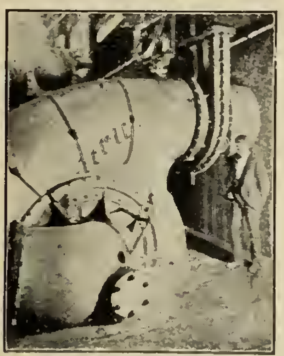
TRADE MARK—REG. U. S. PAT. OFF.



Pump Repaired with Smooth-on Iron Cement No. 1 six years ago, and still in use.

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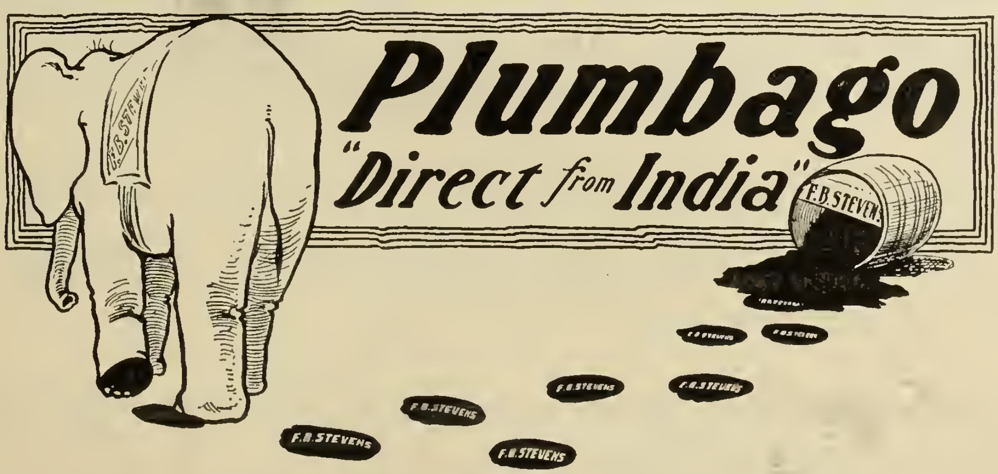

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Stevens' Pure Plumbago

has left its foot prints all over the land. The same foot prints are shown in the reduced cost, in the cleaning room and with the chipping gang : : : : : : :

You can reduce your own expense in your Foundry in the same way by using my plumbago. It's the "pure quill" from India's coral strand. Both quality and price are attractive.
TRY A BARREL AT MY RISK ; YOU ARE TO BE SUITED OR YOU NEED NOT PAY.

I manufacture Foundry Facings and Supplies, Buffing Compositions and Platers' Supplies, and they all bear the stamp of quality.

FREDERIC B. STEVENS - Detroit, Michigan

Facing Mill	Warehouse and Office	Export Warehouse
Cor. Isabella Ave. and M.C.R.R.	Cor. Larned and Third Sts.	Windsor, Ont.

THE MAN WHO WANTS TO SHOW HIS CONTEMPT FOR TECHNICAL PAPERS,

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And in the sense that he speaks it is true. No busy man pretends to read the bushels of them that are dumped on his desk uninvited.

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In every line of importance there is at least one such publication. The advertising problem of the man who must sell to that particular class of readers or stop manufacturing, is simply to find out which paper or papers are *the* papers in that field and *use* these papers, liberally and persistently.

It doesn't pay to scatter small ads among many papers. It does pay to use sufficient space for adequate representation in the few which are known to have a following in the field to be exploited, giving more thought to the making of good copy than to the production of inquiries at so many cents each.

Buyers in technical and trade fields are conservative and deliberate; they are not in the habit of sending for catalogs and things that are "free," like those who read mail order papers and are willing to exchange postal cards for a big mail. An inquiry from an ad in a trade or technical paper generally means that there is a prospective buyer at the other end of the line—one worth the personal attention of a salesman.—*Selling Magazine.*

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have attained the greatest success of any air tools ever placed on the market. For power, durability and all-round efficiency they are beyond comparison. Their superiority is attested by the fact that in exhaustive competitive tests in the largest plants they have invariably won out over all other makes. *Catalog?*

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Manufacturers of Piston Air Drills, Reaming, Tapping, Portable Grinding Machines, Reversible Flue Rolling and Wood Boring Machines, Pneumatic Riveting, Chipping, Calking and Beading Hammers, and Air Appliances of every description.

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WILL SAVE YOU 55% in the cost of Cleaning and Finishing your castings.

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It's the modern method aside from the economical standpoint. CATALOGUE ?

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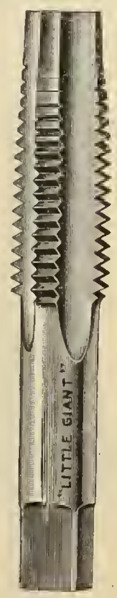

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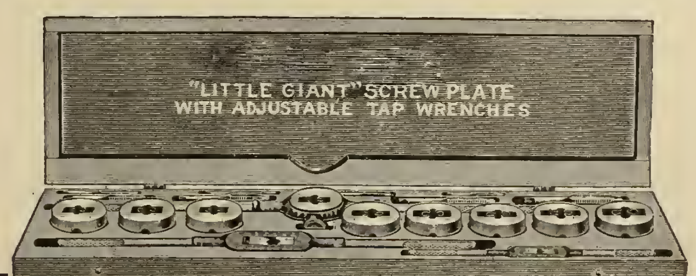

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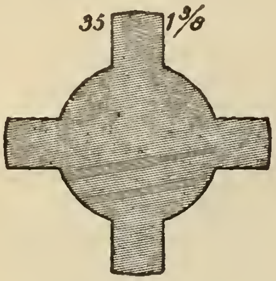

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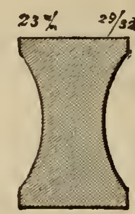

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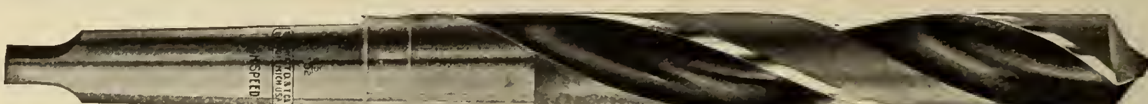

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Send us your Next order for High Speed Drills and watch the results.

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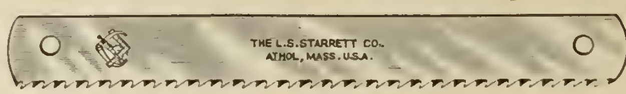

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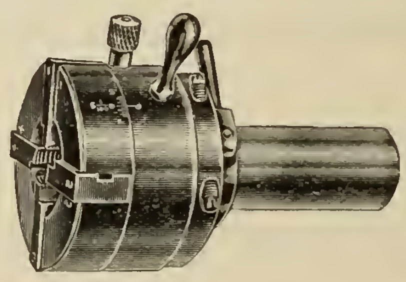

Their use on screw machine or turret lathe is a positive guarantee for greater profits, increased output and a higher quality of work. Their action is automatic.

No running back after each cut, they are self-opening and adjustable.

Made in sizes for cutting any diameter from the smallest screw up to 4½ inch bar, right or left hand threads—standard or special pitch—to any length.

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Tell us the range of thread cutting to be done, also diameter of turret holes, and we will recommend the proper tools.

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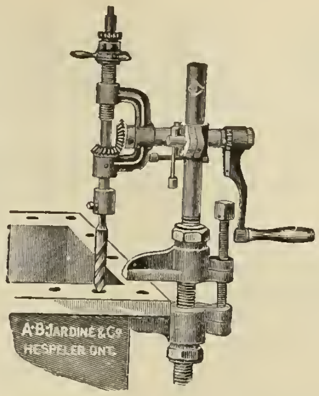

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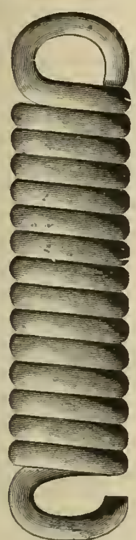

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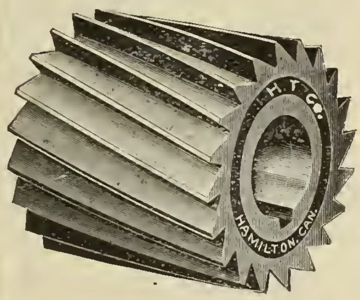

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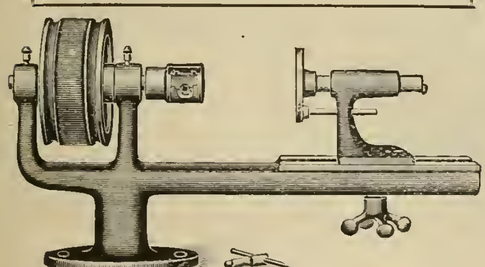

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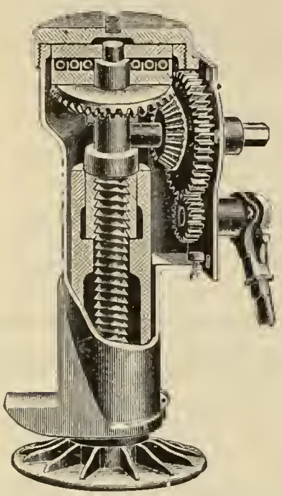

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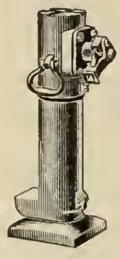
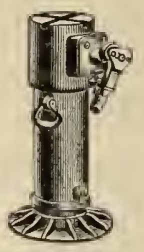
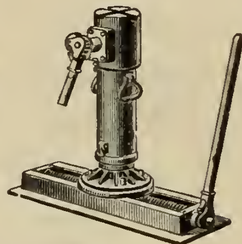
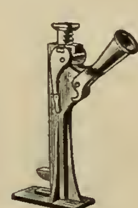
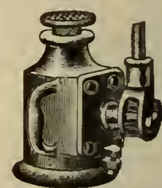

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MONTREAL, 232 McGill Street. TORONTO, 10 Front Street East. WINNIPEG, 511 Union Bank Building. LONDON, ENG., 88 Fleet Street, E.C.

Vol. IV. Publication Office: Toronto, December, 1908. No. 12

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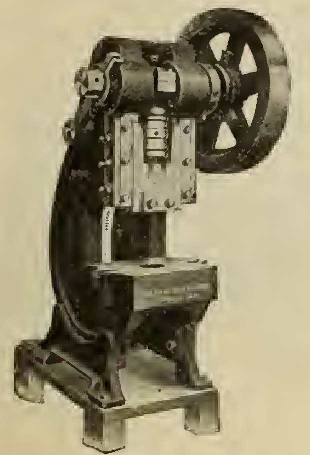

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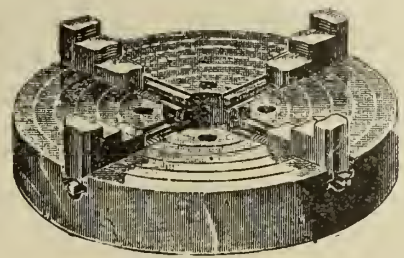

A really good Canadian-made chuck, equal to the best imported line but considerably lower in price. It has a strong, flawless body with the weight well distributed; solid fitting, accurate working, interchangeable jaws, interchangeable screws that are snug-fitting and true and which turn with uniform resistance under the wrench.

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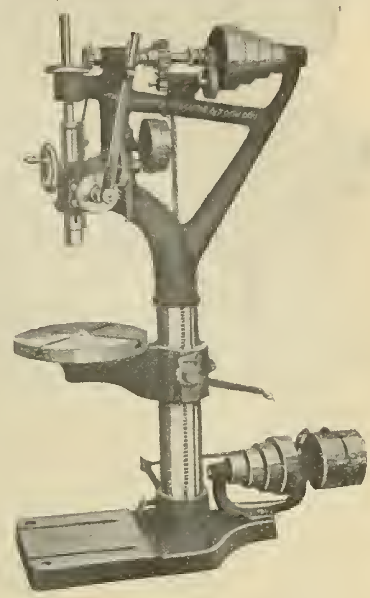

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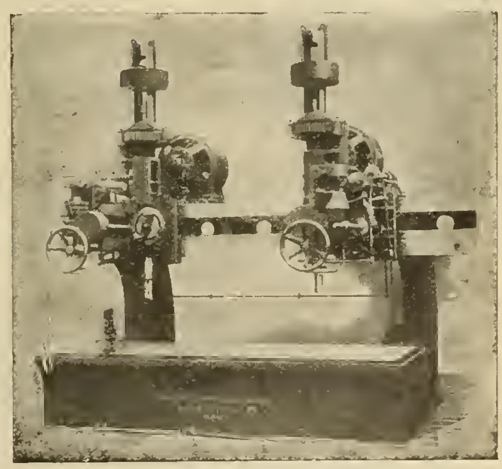

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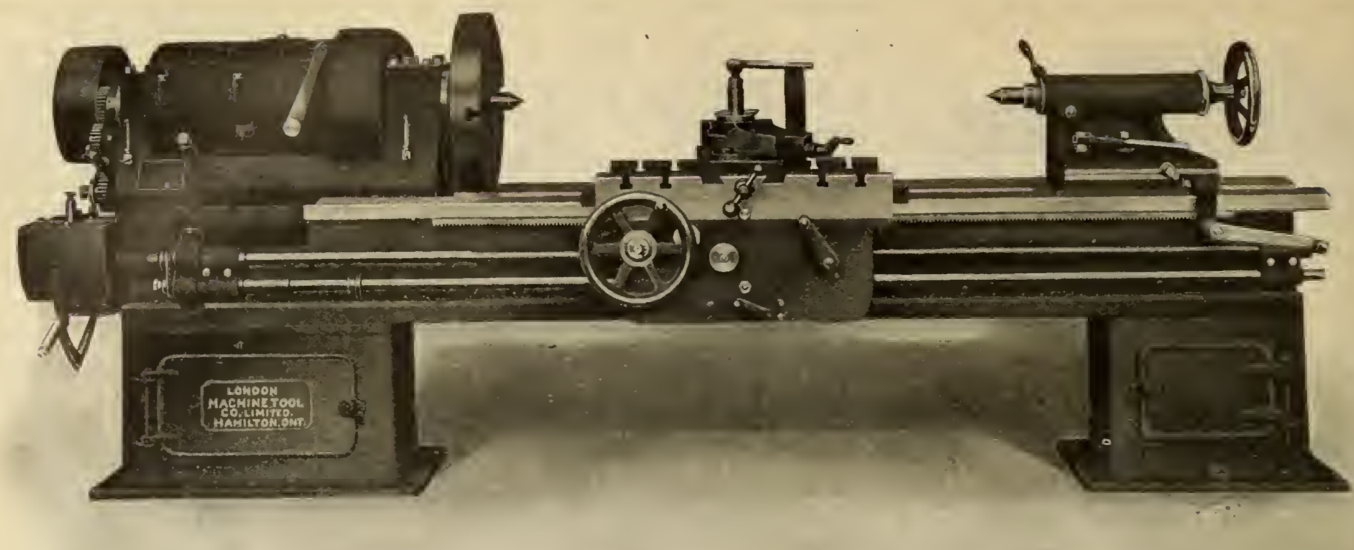


THE LATEST TYPE OF 22" ALL GEARED LATHE

What will it do?

Any lathe work that any other lathe of similar size will do and much that no other lathe of similar size can do.

How is that?

The design is so radically different from the regular cone pulley lathe that feeds, speeds and power heretofore impossible are thoroughly practicable with this lathe.

How about production costs?

They are very much lower than when the work is done on the ordinary engine lathe.

How about the cost of the Machine?

It is not much more than the old design of lathe.

We have this lathe ready for immediate shipment in various lengths up to 14 ft. Over 14 ft. in reasonably short time.

Write us for price and full particulars.

London Machine Tool Co., Limited

Hamilton - - - Canada

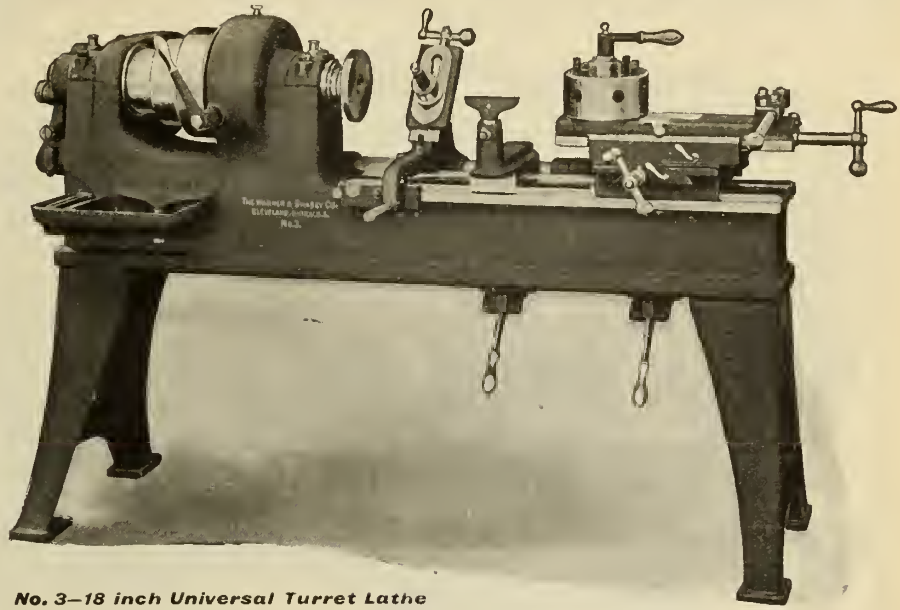
WARNER & SWASEY TURRET LATHES

For Brass and Iron Work—Complete Equipments—Types and Sizes for Every Requirement.

Every modern facility provided for rapid production.

The UNIVERSAL TURRET LATHE here illustrated, is particularly adapted for general work.

80-page catalog illustrates our complete line of labor-saving, cost-reducing machine tools, and it should interest any progressive manufacturer.



No. 3—18 inch Universal Turret Lathe

The Warner & Swasey Co., Cleveland, Ohio, U.S.A.

TURRET LATHES SCREW MACHINES BRASS-WORKING MACHINE TOOLS

Canadian Agents: A. R. Williams Machinery Co., Toronto and Williams & Wilson, Montreal.

Reduce Cost—Outstrip Competition

The only effective way to outstrip competitors in the Business race is to reduce cost. Produce your output in greater quantities at a less cost and you can sell cheaper while still making an excellent profit. The **Dill Slotter will help you** to accomplish this. It is the most up-to-date slotter on the market, having many time and labor-saving features possessed by no other machine. Not the least of these is the Travelling Head by which the tool may be fed to work that is too cumbersome to be fed to the tool.

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THE DILL SLOTTER PEOPLE

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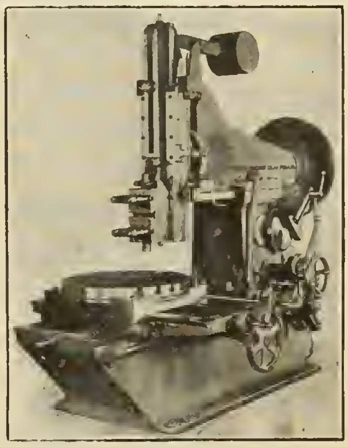

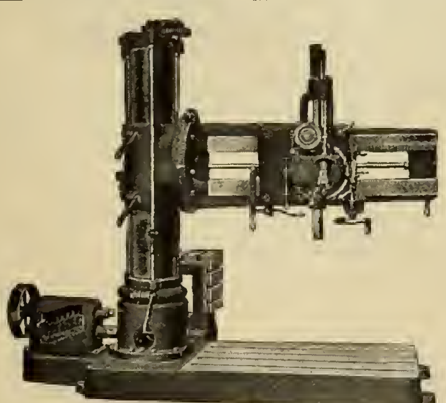

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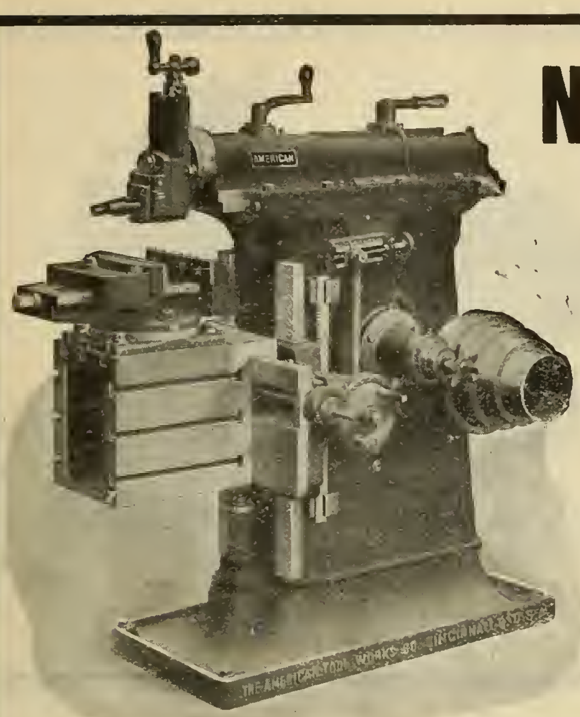
The Bickford Drill & Tool Co.,

Cincinnati, Ohio, U. S. A.



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(PATENTED)

Combined Tool Room and Manufacturing

15" SHAPER

20 to 65 Strokes per minute.
Graduated Cross Feeds, 1 to 25 notches.
Automatic Stop to Table (Fool Proof.)
Keysealing Capacity, 2½" under ram.

Telescopic Elevating Screw.

Full length TAPER JIB ADJUSTMENT throughout.
Special Lubrication Features including Felt Wipers, Rotary Table, Tilting Top Table, Swivel Jaw Vise, Circular Attachment, Etc., can be furnished.

POWERFUL — HIGHLY ACCURATE — DURABLE

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THE AMERICAN TOOL WORKS COMPANY

700 to 750 CULVERT STREET, - CINCINNATI, OHIO, U.S.A.

LATHES — PLANERS — SHAPERS — RADIAL DRILLS

Write Direct or to Agents: WILLIAMS & WILSON, Montreal; A. R. WILLIAMS MACHINERY CO. LTD., Toronto, Winnipeg, Vancouver.

TEST IMONY!

"x x x x x x. Re your Bateman high speed planers x x x x x x. We are quite satisfied that the work turned out is quite accurate although it runs at such a high speed, indeed we make a point of putting our most particular work on this machine x x x x x x."

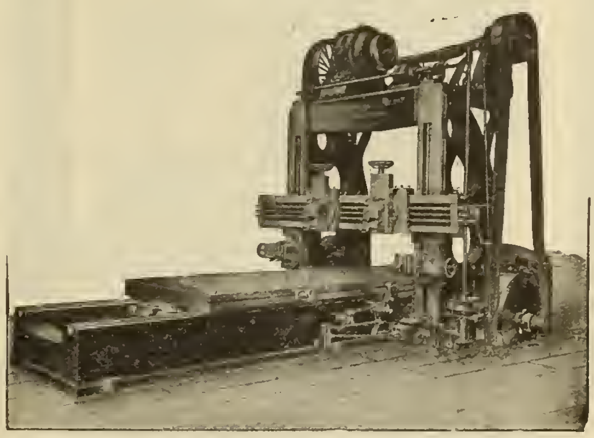
The machine above referred to has given satisfaction for over 4 years — resutl, 2 repeat orders.

Bateman "Topspeed" Planers

have proved most successful "cost" and expense reducers.

Lowest installation and maintenance costs per unit of work done.

Get a Catalogue, post free. Address

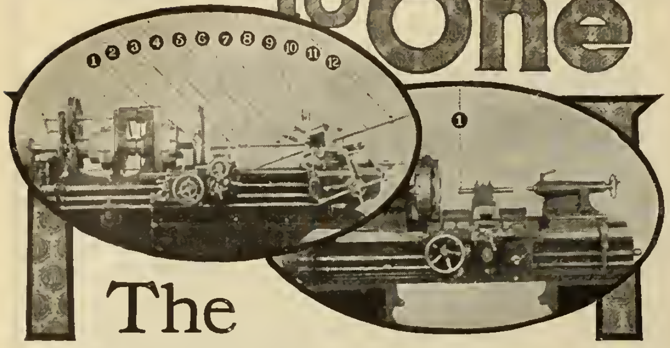


Illustrating two 42" machines supplied to the Midland Railway Co's. Derby Works.

Bateman Machine Tool Company, Limited

Hunslet Planer Works - Leeds, England

A Dozen to One



The Gisholt and the Engine Lathe

THINK what a dozen cutters on the Gisholt means to the single tool on the engine lathe. And even a dozen isn't the limit on the Gisholt. There are stations for 10 different tool holders any one of which may hold from one to six tools. Think of the metal you can remove by these methods.

Is it any wonder that the Gisholt will do work so rapidly?

Gisholt Machine Company

WORKS:
Madison, Wis. and Warren, Pa.

GENERAL OFFICES:
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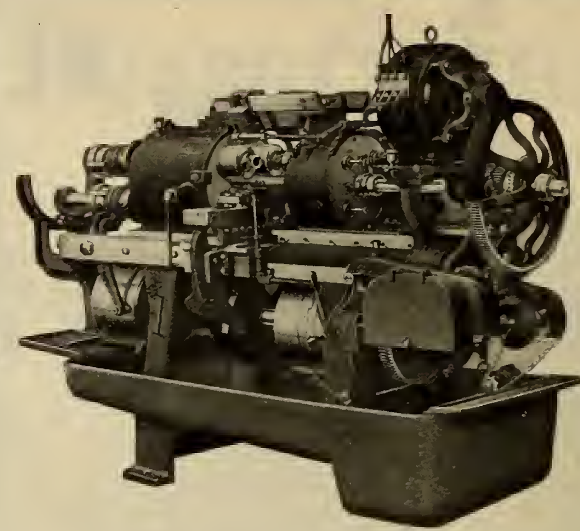
1017 B.

Inquiries may also be addressed to H. W. PETRIE, Ltd., Toronto or Montreal



The Acme Automatic Multiple Spindle Screw Machine Motor Driven

IT'S

More Rapid
More Powerful
More Convenient
More Productive
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IT'S

Safer
Quieter
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IT'S

Driven by One Belt or One Motor

IT'S

the Only Machine with this Simple, Easily Operated, Practically Noiseless Drive

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National-Acme Mfg. Co.

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Branch Offices:

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The every-day operation of a milling machine depends much on the character of the feed-changing and feed-tripping mechanism, and the table operative features. The perfection of these on

KEMPSMITH

MILLING MACHINES

is only one indication of the real high class of these machines.

The Kempsmith Mfg Co.

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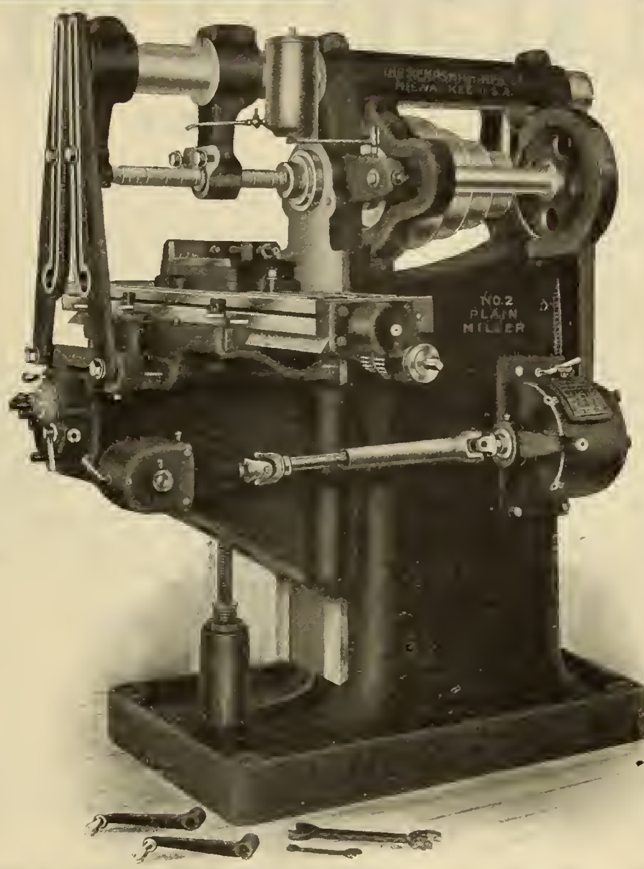

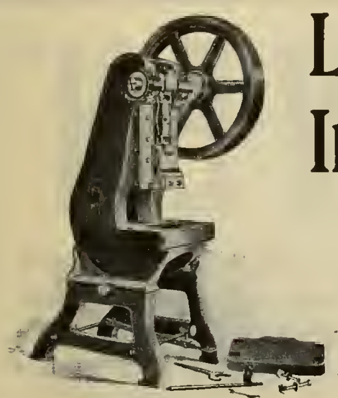

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Made in all sizes

Specially Adapted for All Sheet Metal Work

ALL SIZES IN STOCK

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MONTREAL

A Very Dependable Miller

This is our No. 3 Milling Machine, built to give the best kind of service. In design, it is right up-to-date, solidly and accurately constructed, and warranted to give highly satisfactory results.

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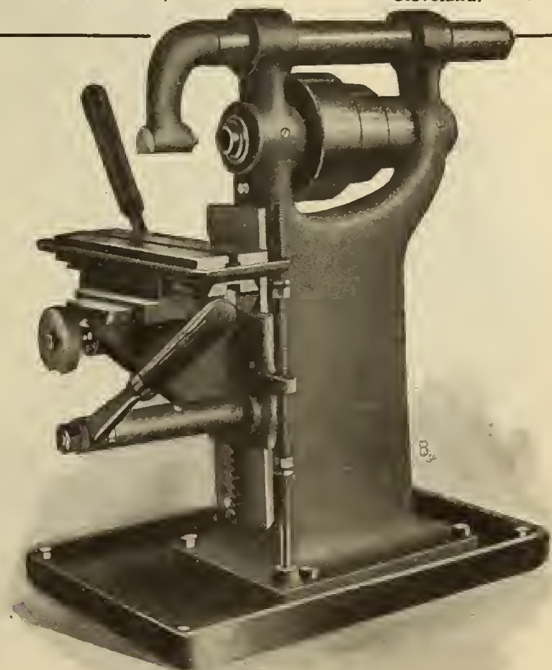

MACHINERY FOR SALE

LATHES

- One new 32"x16' New Haven (triple geared)
- One refitted 30"x14' screw-cutting
- One new 28"x16' New Haven
- One refitted 28"x8' Dundas
- One refitted 25"x14' Sarnia
- One new 24"x16' New Haven
- One refitted 24"x10' screw-cutting
- One refitted 24"x9' Dundas
- Two new 22"x12' Lodge & Shipley
- One refitted 20"x8'6" Putnam.
- One refitted 20"x8' Putnam
- One new 19"x8' Greaves Klusman
- Two new 18"x8' Rahn Carpenter
- One refitted 18"x8' screw-cutting
- One refitted 17"x8' Greaves, Klusman.
- One refitted 16"x10' Bertram.
- Two new 16"x8' Lodge & Shipley (patent head)
- One new 16"x6' Rahn Carpenter
- One refitted 16"x6' Gardner.
- One new 15"x6' London.
- One refitted 12"x8' back-geared
- One new 12"x6' Champion
- One refitted 12"x6' screw-cutting
- One refitted 12"x5' screw-cutting
- One refitted 10"x42" Star
- One 27"x48"x12' Dundas gap
- One 23"x37"x18' Dundas gap
- One 18"x36"x14' back-geared gap.
- One 18"x25"x10" Rahn Carpenter gap.
- One 17"x33"x12' back-geared gap
- One 11"x51" Barnes foot-power
- One new 24" Gisholt turret
- Three No. 3 Brown & Sharpe turret.
- One No. 1 Bardons & Oliver turret
- One refitted 15"x5' speed
- One new 12"x5' Wells speed
- One new 12"x4' Wells speed
- Two new 11"x48" Pitman bench
- Two double-end polishing lathes

DRILLS

- One refitted 36" B.G. hand-feed
- One new 32" B.G. Mechanics
- One refitted 30" B.G. New Haven
- One new 28" B.G. Kern
- One refitted 28" B.G. power-feed
- One rebuilt 26" B.G. Barnes
- Three new 24" B.G. Cincinnati.
- Four new 20" B.G. power-feed
- Five new 20" power-feed
- Two new 20" wheel and lever-feed
- Two refitted 20" wheel and lever-feed.
- One refitted 20" lever-feed.
- Three new 20" Mechanics friction
- Two new 16" lever-feed sensitive.
- Two new 15½" Knight combined drill and milling machines
- Two new 14" Mechanics lever-feed
- One new 13" Reed sensitive
- One refitted 12" lever feed
- One refitted 11" hand-feed
- One new No. 14 Silver hand-power
- One new No. 13 Silver hand-power
- One new 14" bench sensitive.
- One refitted 98" Niles radial
- One refitted 72" McDougall radial

IRON PLANERS

- One 42"x42"x20' Putnam
- One 36"x36"x12½' American
- One 36"x36"x10" Bertram
- One 30"x30"x8' Dundas
- One 28"x28"x7' Gibson
- One 24"x24"x7' Dundas
- One 24"x24"x6½' London
- One 24"x24"x3' American
- One 23½"x18½"x24" with vise
- One 23"x18"x5' English
- One 20"x20"x50" with vise
- One 12"x12"x27" American

IRON SHAPERS

- One 15"x48" openside Cincinnati
- One 15"x30" openside Cincinnati
- One new 32" B.G. Cincinnati
- Two new 24" B.G. Rockford
- One nearly new 24" B.G. Sarnia
- One new 16" Smith & Mills
- One refitted 16" London
- One 10½" Fitchburg traverse head
- One refitted 9" gear-driven
- One new 7" Rhodes hand or power

MILLING MACHINES

- One new No. 2 plain Cincinnati
- One refitted 12"x42" back-geared
- One new No. 3½ Fox, hand or power feed.
- Two new No. 3 Fox, hand or power feed.
- One refitted No. 3 Reed Co.
- Two new No. 2 Fox, hand-feed
- One refitted geared bench miller
- One refitted 27"x6"x13" Lincoln

BOLT AND PIPE MACHINES

- One new 2" bolt cutter, with Galt-Culver automatic head
- One refitted 2" bolt cutter
- One refitted 1" Acme bolt cutter
- One refitted 2½"—5" Curtis pipe machine
- One new 1"—4" McDougall pipe machine
- One refitted ¼"—2" Jarecki pipe machine, hand or power
- One refitted ¼"—2" Apex pipe machine, hand or power
- One refitted ¼"—2" Wells pipe machine, hand or power
- One nearly new ¼"—2" Borden hand pipe machine

POWER PRESSES

- Four new No. 21 power presses
- Three new No. 20 power presses
- Eight new No. 19 power presses
- Four new No. 18 power presses
- One refitted No. 4 Sarnia
- One refitted No. 4 Stiles & Parker
- One refitted No. 2 Stiles & Parker
- One refitted No. 2 Fowler's patent
- One refitted Bliss stamping press
- One new No. 1 foot-power press

GRINDERS

- One new cutter and reamer grinder
- One refitted stove plate grinder
- Two new American centre grinders
- One nearly new No. 10 motor-grinding attachment
- Ten new pedestal grinders
- Eleven new bench grinders
- One automatic surface grinder
- One No. 2 water tool grinder
- One new bench twist drill grinder
- One Perkins automatic saw g'nder

MISCELLANEOUS

- One new 30" Gisholt boring mill
- One refitted 36" Gould & Eberhardt gear-cutter
- One 350-lb. Bell steam hammer
- One 450-lb. Bell steam hammer
- One No. 25 Bradley helve hammer
- One 18" Bremer punch and shear
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- One 87" plate bending rolls
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- One new 2" cutting-off machine
- One new 16" Globe tumbling bbl.
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- One new Buffalo portable forge

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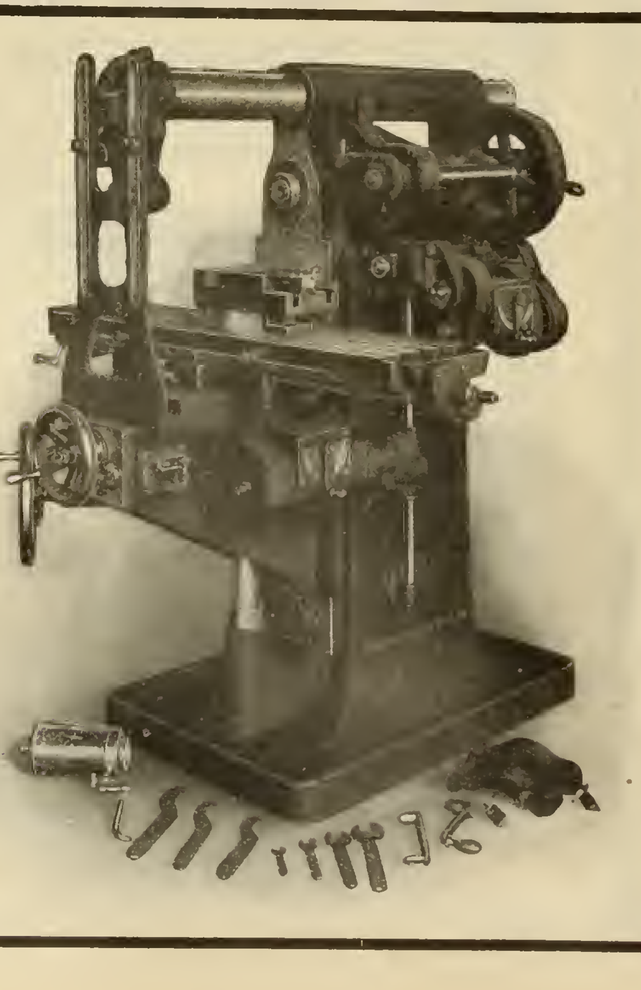

"OWEN"

No. 2-B Plain

A model of simplicity, rigidity and accuracy. A modern tool throughout. If you haven't one, better get in line; you will never regret it.

Let us send you full descriptive matter and tell you more about it.

Milling Cutters of all kinds. Machinery and Special Tools built to order. Prompt deliveries and reasonable prices.

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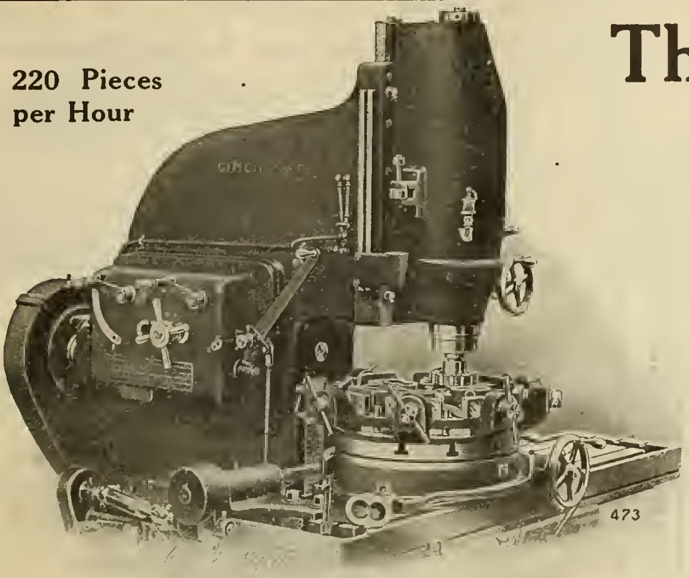
220 Pieces per Hour



The No. 2 Vertical in Action

We mill these grey-iron pieces at the rate of 220 per hour.

The cutter is 5½ in. diameter, makes 45 revolutions, takes a cut ⅛ in. deep, over surfaces, 2⅞ x 4½ in.

They are held in a special fixture mounted on the Standard Circular Attachment which revolves continuously at a rate which may be set to allow the operator only just time enough for chucking. He need do no unnecessary work, such as returning the table or readjusting the machine. He can put all his energy into handling the pieces. THIS IS CONTINUOUS MILLING. Don't you make quantities of similar pieces ? You should mill them on a Cincinnati Vertical in the "Cincinnati way." Ask us for suggestions.

WE ARE MILLING SPECIALISTS

THE CINCINNATI MILLING MACHINE CO.

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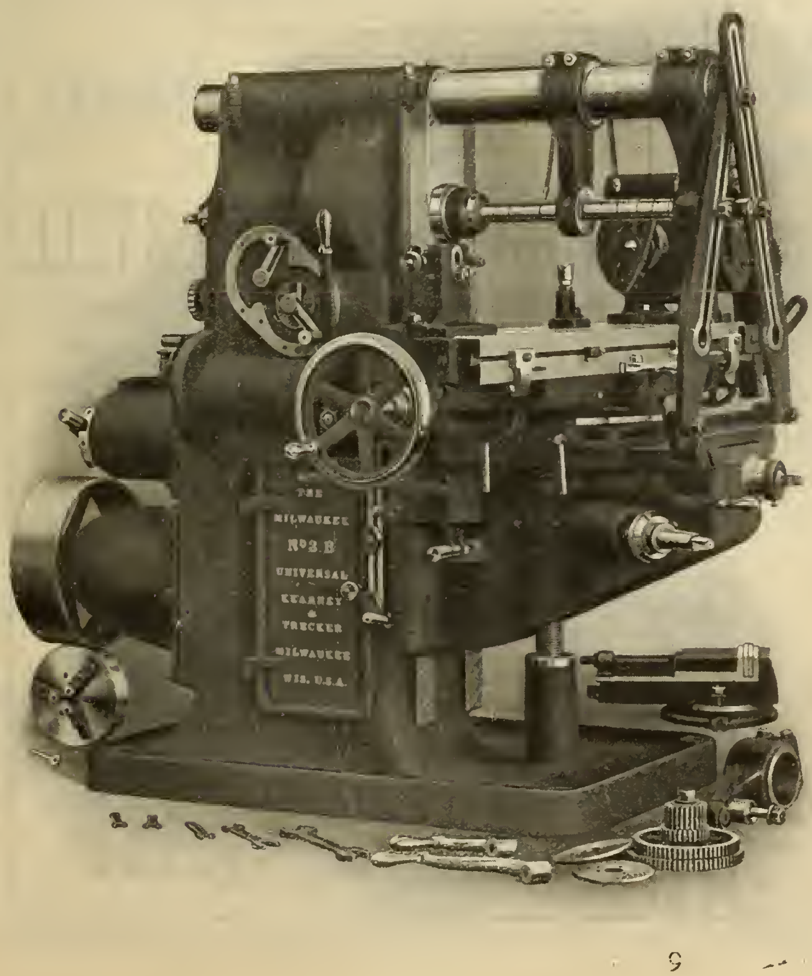
Canada Agent—H. W. PETRIE, Ltd., Toronto, Montreal and Vancouver.



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No. 3B Universal Miller

is one of a line of Plain and Universal Milling Machines for heavy duty service having great weight and structural strength in comparison with range. Powerful drive through single pulley as shown or at right-angles. Electric drive applied without difficulty at any time. All gears and bearings automatically flooded with oil. Every machine equipped with pump for cooling and lubricating the cutters and with means provided for returning the cutting lubricant to its reservoir. Wide table for jig work with ample bearings for maintained accuracy. Accurate screws with sensitive graduated adjustments—all adjusting and feed screws have ball thrust bearings. Dividing wheel double the size usually used—accuracy equal to the best.

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Crank
Geared
Traverse
Open Side

CRANK PLANERS

H. W. PETRIE, Limited. Agent
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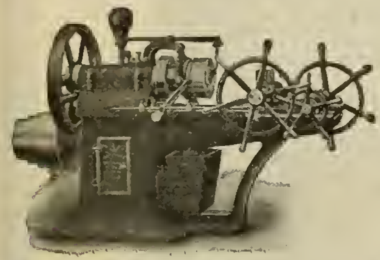
The CINCINNATI SHAPER CO., Cincinnati, Ohio, U.S.A.



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BOLT AND NUT MACHINERY

INCLUDING

Bolt Cutters, Nut Tappers, Bolt Headers, Upsetting and Forging Machines, Wire Nail and Spike Machines and Bulldozers.

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NATIONAL MACHINERY CO., Tiffin, Ohio, U.S.A.

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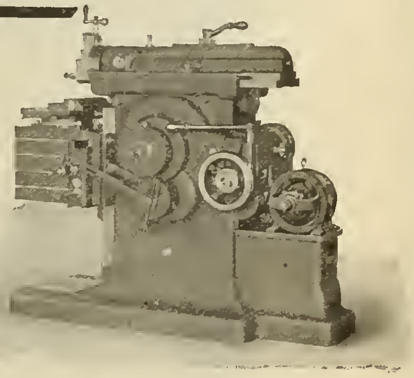
A NEW 18" ALL GEARED

STOCKBRIDGE



with all the original features (see description in November Canadian Machinery, or write us) that have won for Stockbridge Shapers a name, as a leader, and we have added more original features in this machine—features that count in production. Those are the only kind found in Stockbridge construction.

Stockbridge Machine Co., - Worcester, Mass., U.S.A.

1833 1908

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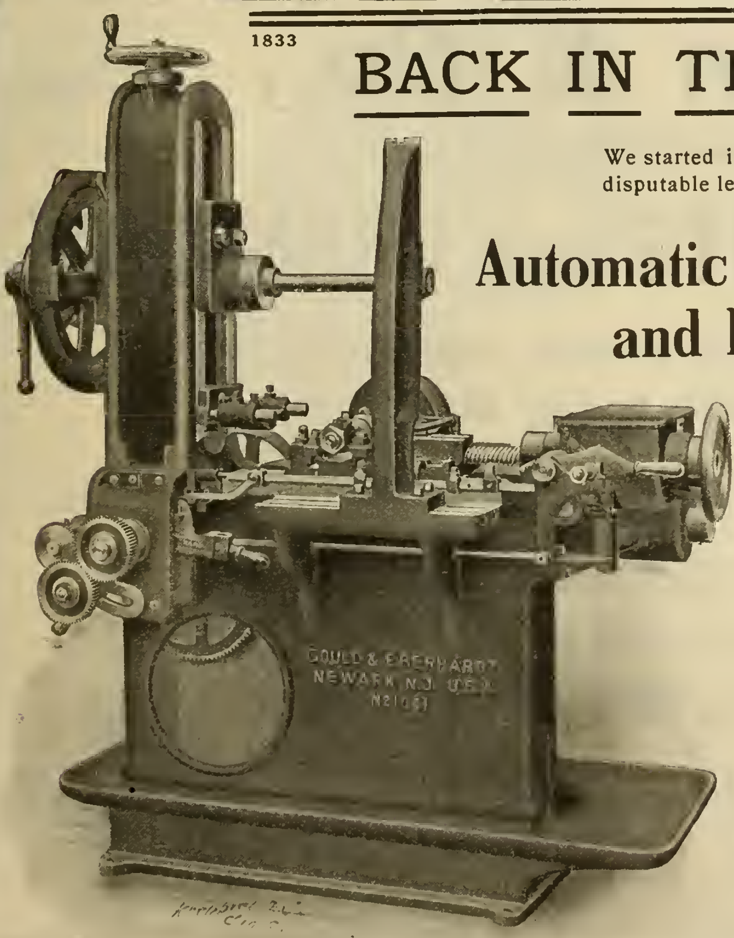

We started in to manufacture machinery and we have been the indisputable leaders in our line ever since. For the manufacture of

Automatic Gear Cutting Machines and High Duty Shapers

we have been awarded many gold and silver medals. Our machines are guaranteed to stand up to their work and give absolute satisfaction. We have something especially interesting to say to intending purchasers. Send your inquiries for Shaping Machines direct to us, and for our Gear Cutting Machines to H. W. Petrie, Montreal or Toronto.

GOULD & EBERHARDT
"HIGH DUTY" SHAPERS
AUTOMATIC GEAR AND RACK CUTTING MACHINERY
ESTABLISHED 1833 NEWARK, N.J. U.S.A.

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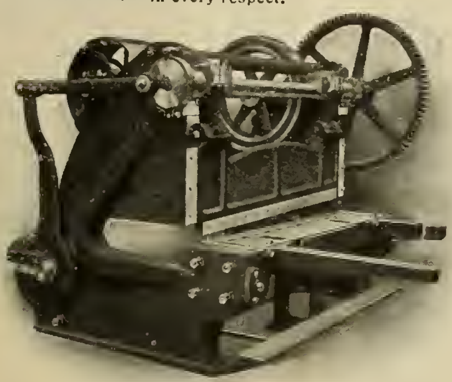
ARE EXPERTS ON SHEAR CONSTRUCTION

They make Shears to cut any width and thickness, as well as every type of Shear:—Guillotines, Slitting Shears, Circle Cutters. Billet Shears, &c. ***"RHODES"*** Shears combine the best technical skill and almost a century of practical experience! Every pound of metal is in the right place. ***"RHODES"*** Shears are ***THE BEST IN THE WORLD*** in every respect.



HIGH SPEED SHEARS with deep throat and scrap cutter: cuts 5ft. wide x ¾in. thick

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Works, WAKEFIELD, ENG.

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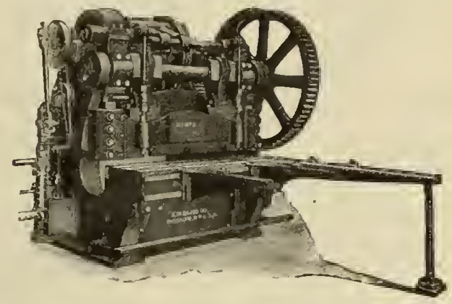
SQUARING and SLITTING SHEARS

The machine shown is intended for shearing the heaviest kind of stock, but we make shears of all sizes and solicit inquiries regarding them.



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We are the largest designers and builders of

Sheet Metal Working Machinery

and we guarantee it to be first-class in every respect.

E. W. BLISS CO.

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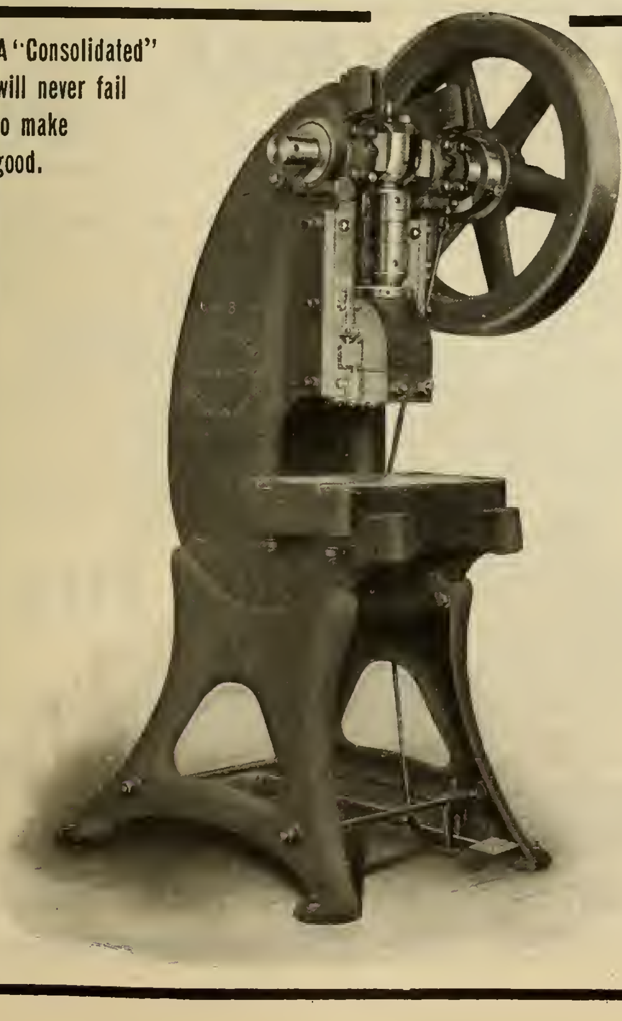
A "Consolidated" will never fail to make good.



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We know that you are always on the lookout for ways to save money and reduce your cost of manufacture.

We are confident that we can **PROVE** to you beyond a question that "Consolidated" presses will save a percentage of the time of your operator varying from 10% to 25%.

The "Consolidated" has all working points directly in front, within reach of the operator, so that there is no time lost in trotting around to the back of the press to make adjustments.

'Consolidated" presses have a connection that will stay where you put it (no matter how often you change it), and a clutch that will run day after day without jamming. This feature alone should save an hour a day—at 20c. an hour, three hundred hours in the year, a total of at least $60.00.

Will you not permit us to demonstrate the truth of our claim? At any rate write for a copy of our new catalogue for your library.

Consolidated Press and Tool Company

PRESSES AND SHEET METAL MACHINERY

HASTINGS - MICHIGAN

"NOVO" STEEL HIGH SPEED

"INTRA" AN INTERMEDIATE GRADE

ROUND, SQUARE AND FLAT BARS IN STOCK

Twist Drills

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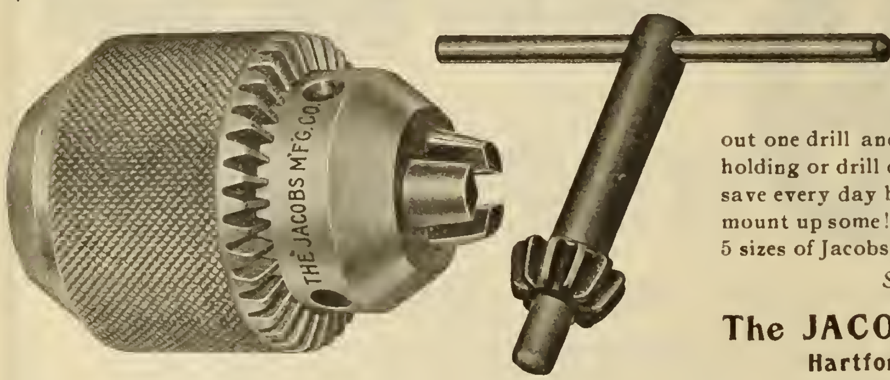
HIGH GRADE MACHINE TOOLS IN STOCK

15" x 6' Engine Lathes
18" x 8' x 10' do
27" x 14' do
24" x 24" x 6' Iron Planers
30" x 30" x 8' do
36" x 36" x 14' do
16" Iron Shapers
20" Vertical Drills
21" do
No. 3 Universal Milling Machine

Canada Machinery Agency

298 St. James St., Montreal

THIS IS A MUCH BETTER DRILL CHUCK



than the ordinary old-fashioned kind. It is the JACOBS IMPROVED DRILL CHUCK. It operates with a key—not a spanner. Only a turn of the wrist is necessary to take out one drill and put in another. No spanner using, belt holding or drill dropping. Figure out the minutes you can save every day by instantaneously changing tools. It does mount up some! We have an illustrated booklet showing all 5 sizes of Jacobs Improved Drill Chucks.

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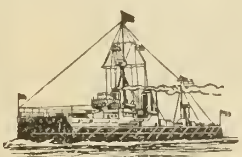
The JACOBS MANUFACTURING CO.
Hartford, - Conn.



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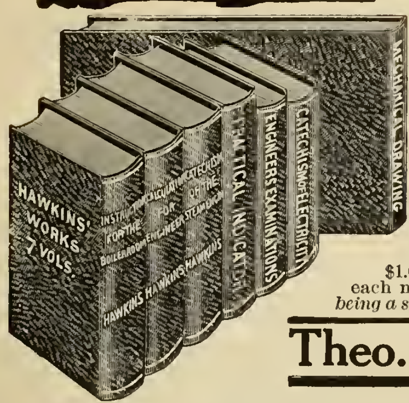

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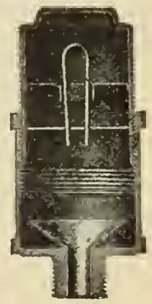

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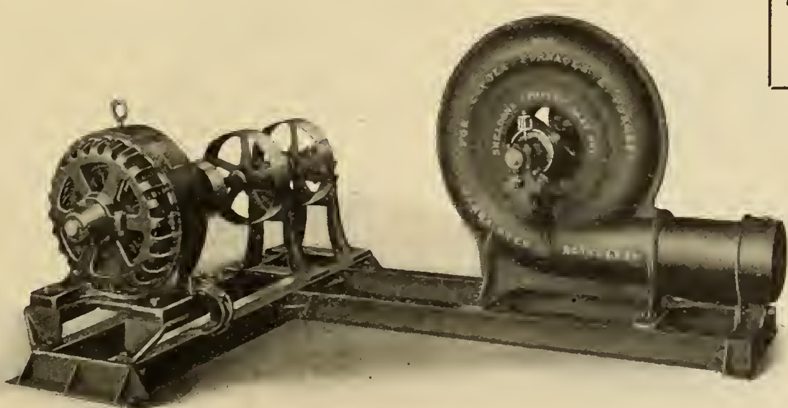

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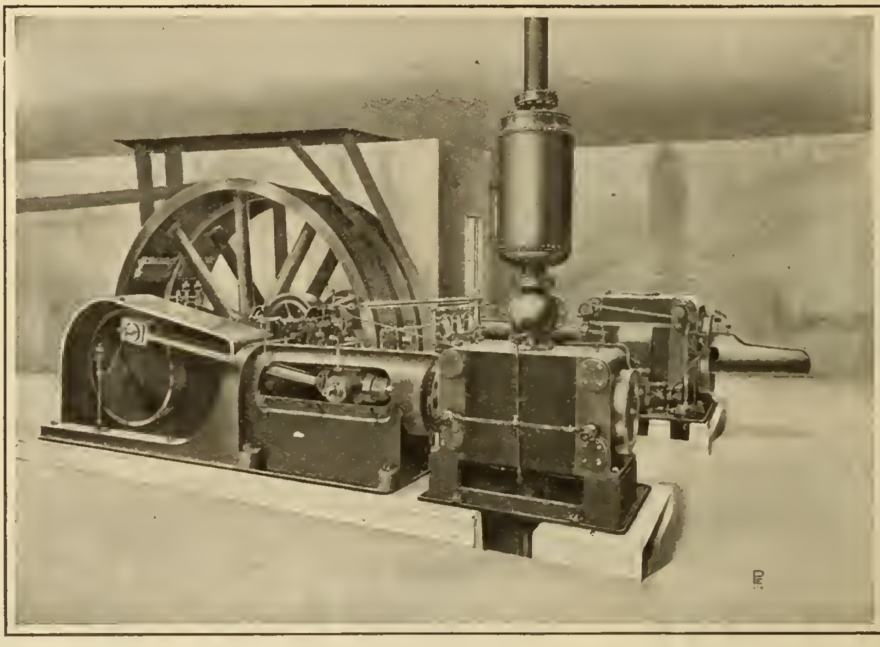

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Modern Plant of Berlin Machine Works, Ltd., Hamilton

Substantial Brick Buildings with Saw-Tooth Roof on Machine Shop—Modern Equipment Throughout—Interior Transportation Well Provided For, with Narrow Gauge Track, Cranes, etc.—Good Shipping Facilities.

The Berlin Machine Works have started manufacturing in their new plant in Hamilton. They will place on the Canadian market duplicates of the complete line of wood-working machinery now being manufactured in the works at Beloit, Wis., one of the largest plants for the manufacture of wood-working machinery in the world. The Canadian factory is owned by the same interests which operate the American plant. The establishment of a Canadian factory is the result of the rapid growth of the Berlin Machine Works and the necessity of taking better care of the Canadian business.

The first machine manufactured by the Berlin Machine Works was a sander. It has been improved and is now known as the Royal Invincible. This was the first power sander. The sandpaper is put on the drum spirally and hence cuts all the time. After the small beginning, manufacturing a sander, the company moved from Berlin to Beloit where they took up the manufacture of all lines of wood-working machinery This year marked a further expansion in their business with the establishment of the Canadian factory.

Fig. 1.—General View Berlin Machine Works.

Construction of Buildings.

The buildings throughout are substantial brick and steel structures large, airy and well-lighted. The largest building is the machine shop with almost 100,000 square feet of floor space. A gallery used as a tool room, runs across the south end of the building with over 10,000 square feet of floor space.

The roof is of saw-tooth design, giving excellent light as well as furnishing good ventilation. In the general view of the plant, Fig. 1, the saw-tooth roof is seen. In Fig. 2 the method of constructing saw-tooth roofs is shown. The saw-tooth roof has many advantages, which commend its use in machine departments. It gives uniform diffusion of light throughout the shop, thus making all space in it available. The white walls and ribbed glass in the sash make the diffusion of light almost perfect. This roof excludes the direct rays of the sun, yet gives the benefit of a long day without the use of artificial light.

The saw-tooth roof is specially adapted to machine shops foundries, wood-working and similar work, such as assembling, drafting, etc. The glass is inclined to the vertical to take advantage of the brighter light in the upper sky, to prevent cutting off the light by the saw-tooth immediately in front. The saw-teeth face north and thus assure the diffusion of light upon the floor. The glass is inclined at an angle of 20 to 25 degrees to the vertical and at an angle of approximately 90 degrees at the top of the saw-tooth.

Saw-tooth roofs necessarily cost more as there is practically the same amount of roofing as in flat roofs, and in addition there is the cost of windows, glazing, flashing, conductors condensation gutters for the flashlights, and a somewhat larger cost of heating. Comparing it with an ordinary building sufficiently high and narrow enough to give the required light, however, there is only a slight additional cost which far outweighs the ordinary building where good light is necessary.

In the machine shop there are two wide bays between the saw-tooth roofs where the cranes are placed. The floors are standard, having the lower floor laid obliquely to the upper hardwood floor. All the other buildings are brick and steel construction. The foundry has increased head-room for ven-

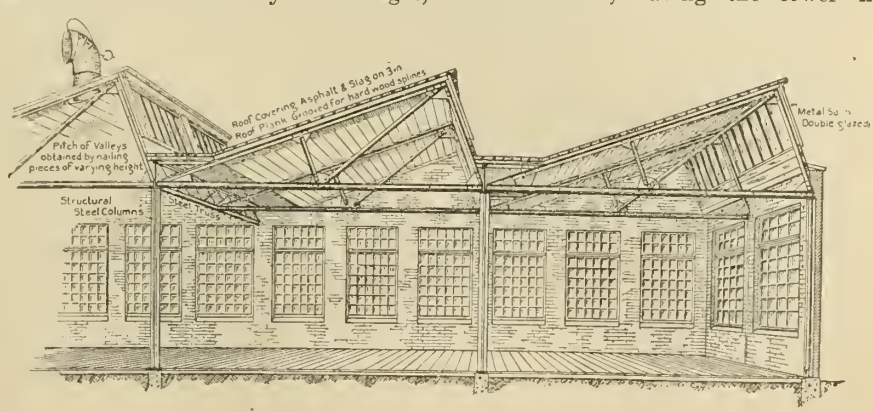


Fig. 2.—Saw-Tooth Roof, Recommended by Mutual Insurance Co. The Saw-Tooth Roof Construction is Used in Berlin Machine Works.

tilation and to allow the use of a traveling crane.

The buildings include machine department, stores, blacksmith shop, foundry, power house, including boiler room; receiving room and pattern room. The concrete basement for pattern stores has been laid and this building, along with the office, will be erected.

Machine Department.

The machines are arranged to secure the full benefit of light from the saw-tooth roof. Fig. 3 shows a large boring mill installed by the London Machine Tool Co., Hamilton. This mill is operated by two. D.C. motors and has an actual swing of 104 inches. The height under the cross-rail is 46½ in. and the height under the tool holder 43½ in. The weight complete is 54,000 lbs. The machines with the exception of this boring mill are arranged for group drive. In the equipment of the machine shop the machines built by the London Machine Tool Co. figure prominently. A row of planers range from 3x3 ft. to 6x6 ft. and accommodate almost any size of work.

A number of Barnes drill presses are in service, also a Becker-Brainard vertical miller, four Jones & Lamson automatic turrets for small and duplicate work, American Tool Works radial drills and lathes of many sizes for duplicate and special work built by John Bertram, Automatic Machine Co., American Tool Works and London Machine Tool Co. A Norton wet grinder is used for finishing the drums. In the centre of the shop is a large special floor drill built by the Berlin Machine Works. Its special service is for drilling machine bases and it will accommodate the largest sizes. The base runs out on both

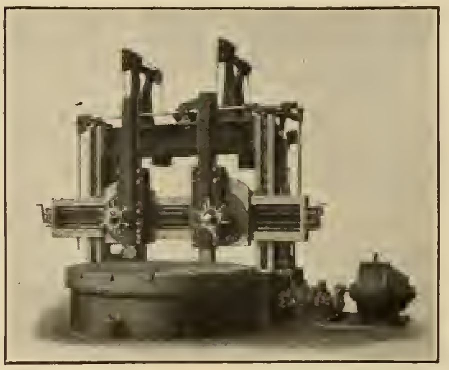


Fig. 3.—104" Boring Mill at Berlin Machine Works.

sides of the floor on small rollers, thus facilitating the handling of the heavy bases. Fig. 4 is a corner of the machine department, showing the arrangement of the machinery in groups under the roof lights.

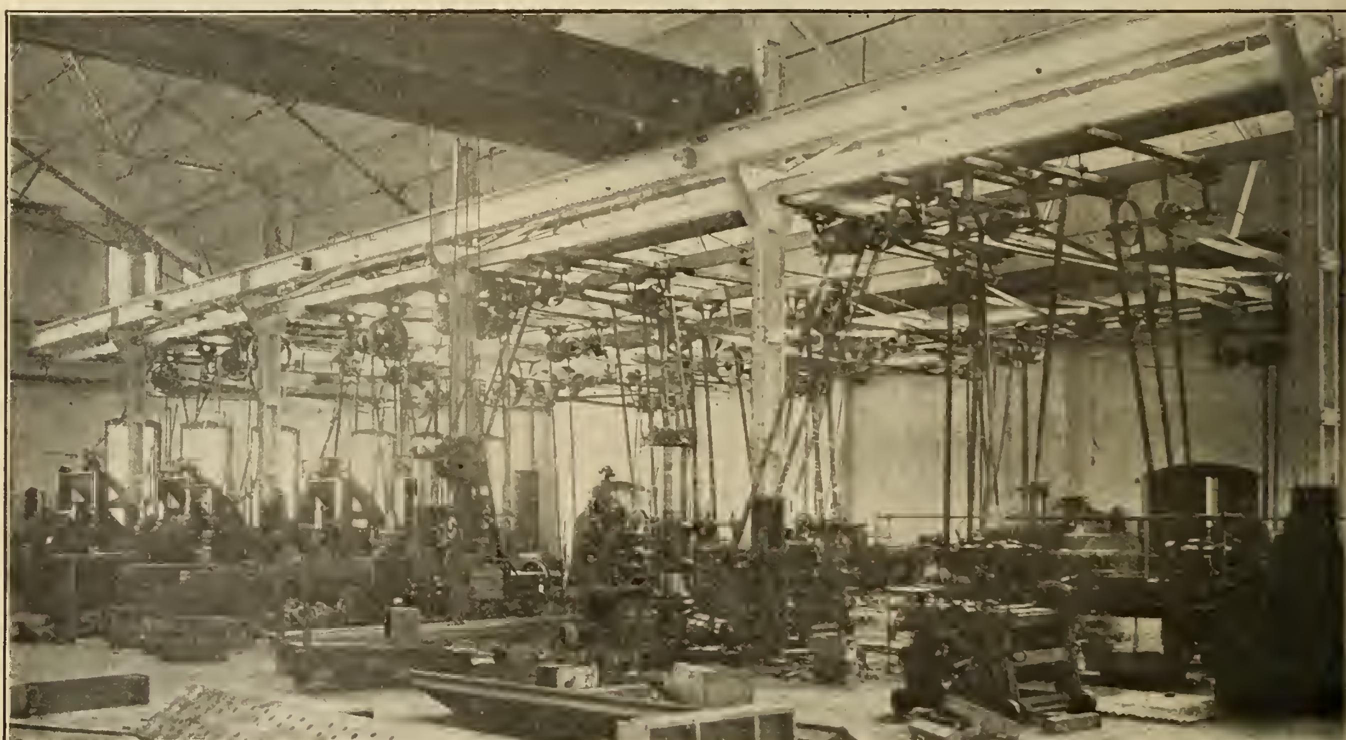


Fig. 4.—Corner of the Machine Department.

The Tool Room.

The tool room occupies the gallery of over 10,000 square feet of floor space, at the south end of the building. It is fully equipped with lathes, planers, grinders and milling machines. Part of the equipment was manufactured by the Berlin Machine Works. The Cincinnati Milling Machine Co. and Kempsmith Milling Machines are in use.

The small parts for the wood-working machines are finished in the tool room. An elevator has been installed for conveying materials to and from the tool room.

The tool store room is at the south of the machine department. The tools are handed out from here to the mechanics and kept track of by a system of brass checks. When a man begins work in the machine department he is given a number of checks, when a tool is required he passes in a check to the tool room clerk. This check is hung in the place of the tool and when the tool is brought back the check is returned to the workman.

Blacksmith Shop, Stores, Etc.

At the north of the machine department is the forge shop. It is equipped with Buffalo forges, cut-off machine built by Hurlburt-Rodgers, Williams-White & Co. trip hammer and a special machine built for straightening shafts. The equipment is well designed to cover the range of work necessary in building wood-working machinery.

Beside the blacksmith shop is the receiving room. This projects several feet beyond the other building to allow the entrance of a freight car, tracks being built into this department. Bar stock is arranged according to size on racks for the purpose. Other supplies are also

distributed from this department as necessity calls for them.

Power Equipment.

The current is received from the Cataract Power Co. at a voltage of 2,200. It is transformed down to 220 volts, there being an equipment of three oil transformers for the purpose. A Canadian Westinghouse motor-generator set consists of one 100 h.p. 200 volts, 2 phase, 60 cycles, 766 R.P.M. motor and one 85 K.W. 220 volts multipolar compound wound type "S" generator complete with field rheostat. This supplies power for the cranes and direct electrical-driven machinery.

A three-panel Vermont Marble Westinghouse switchboard, upon which is mounted the necessary instruments controls the distribution of the current to the electrical equipment. The following Westinghouse induction motors have also been installed:

	H.P.	Volts.	Phase.	Cycles.	R.P.M.
1	100	200	2	60	
1	75	200	2	60	765
2	50	200	2	60	690
2	40	200	2	60	850
1	35	200	2	60	
1	30	200	2	60	1245
2	20	200	2	60	945
1	15	200	2	60	945

The equipment includes a vertical air-compressor belt driven from an A. C. motor. Fig. 5 is a corner of the power house, showing the motor-generator set and switchboard.

The heating of the buildings is accomplished by two boilers made by Brass Foundry & Machine Works. Draft for them is obtained from a 150-ft. circular stack.

The method of receiving the coal is interesting. The track has been built upon concrete piers running onto the top of the coal pits. The coal is then emptied into the coal pits by tripping the arrangement found at the bottom of all dump bottom cars thus making a great saving in the cost of handling coal. The pits form a bay to the boiler room and are built of concrete.

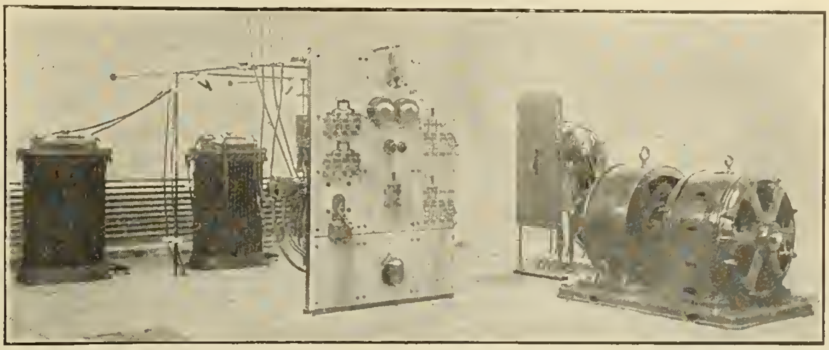


Fig. 5.—Corner of the Power House, Showing Switchboard and Motor-Generator Set.

The fire protection of the plant has been well cared for. Besides yard hydrants, an automatic sprinkling system has been installed throughout. This is connected to the city mains and also to an auxiliary reservoir of 100,000 gallons capacity.

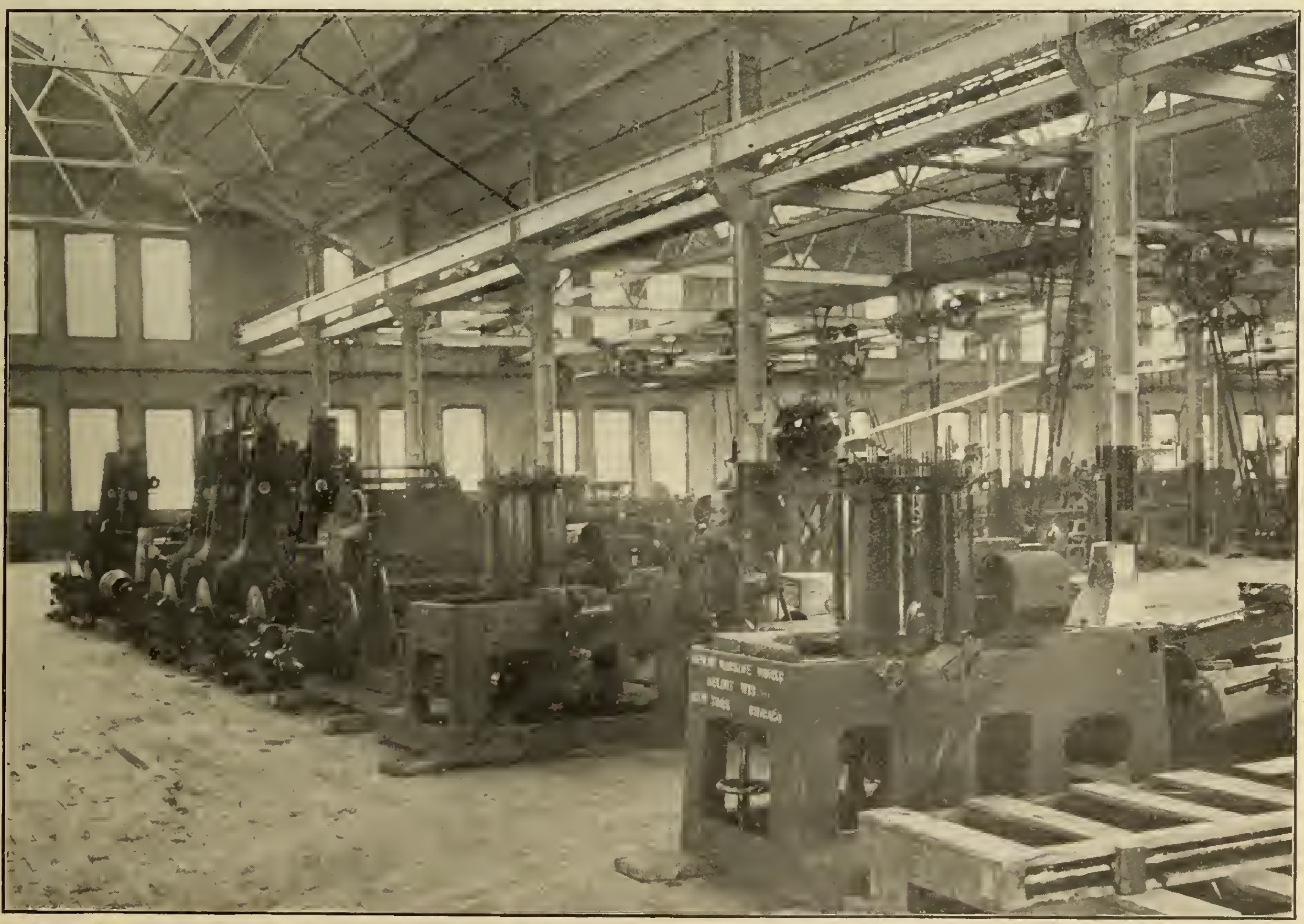


Fig. 6.—Machines Ready for Shipment. This View Also Shows the Building Construction.

Transportation.

The system of transportation between the various buildings and in the buildings is well taken care of by narrow gage tracks with turntables. In the foundry these are used with trucks to carry ladles. The castings are loaded on trucks and taken to stores and machine departments by means of these tracks.

The buildings are equipped with Pawling & Harnischefeger cranes. In the bays in the machine shop are two cranes, one five-ton and another ten-ton, thus facilitating the handling of the heavy material and machinery. The foundry is equipped with one twenty-ton electric traveling crane and the side floor with ten jib cranes.

The factory occupies a twenty-acre tract at the intersection of the G.T.R. and T. H. & B. railways. The company's private tracks connect with both lines. In order to expedite shipments, the company maintains its own locomotives and has more than a mile of track to secure direct connection with the G.T.R. and T. H. & B. As Hamilton is situated on Burlington Bay there are good facilities for shipping by water.

Besides the lines connecting the coal pits and store-room to the main track, there are two lines entering the machine shop. These are depressed, bringing the top of the car to the same level as the machine shop floor. The loading of heavy machinery is therefore greatly simplified.

The machines before being shipped are weighed on a twelve-ton Gurney scales. Fig. 6 is a view of some machinery made in the Hamilton plant ready for shipment.

Foundry.

The main building is large, well lighted and ventilated, covering 28,000 square feet, constructed of brick and steel. On the north side is a wide bay for core-making and core ovens. Two 66-in. cupolas are erected at the north side. One cupola is a Whiting and the other was built by the Northern Engineering Works. Fig. 7 gives a good idea of the foundry arrangement. This view was taken just before pouring. The demand for wood-working machinery will soon necessitate their running at full capacity.

Pridmore molding machines are in use. These are of various shapes to suit the many sizes and shapes of large and small gears and other castings. At the west end are situated four Sly tumbling barrels.

The molds for the bases of the machines are skin dried. This is necessary as the bases weighing about 3,200 lbs. are molded in one casting. Large ladles are run on narrow gage tracks and still larger ones are carried on a traveling crane.

There is good molding sand on the property and as the Hamilton Mountain molding sand supply is almost unlimited there is no danger of a shortness in molding sand.

Fig.7.—Foundry, Showing Large Crane. The Boy at the Right is Core Department. The Cupolas are at the Right of Picture and are Not Shown.

GAS AND GASOLENE ENGINE ORGANIZATION.

There will be a meeting on Wednesday, Dec. 9, 1908, at the Auditorium Hotel, Chicago, to consider the organization of an association of all persons who are interested in gas and gasolene engines, whether stationary, automobile or marine. You are invited to attend or send your views by letter. Call issued by M. A. Loeb, of the Rock Island Battery Co.

ENGINEERS' CLUB, TORONTO.

At their meeting, Nov. 19, the subject of Property Safety Factor for Dams was discussed. A. B. Barry was in the chair and the subject was introduced by John S. Fielding. At the close of the discussion the following resolution was passed:

"That in the opinion of this club the factors of safety usually employed in the construction of dams is too low and that they should be increased to 2½ to 3, instead of 1.3 to 1.8."

Some Efficiency Tests of Milling Machines and Cutters*

Tests Determining (a) Amount of Metal Removed per Horse Power; (b) Efficiency of the Speed Mechanism; (c) Efficiency of Driving Mechanism.

By A. L. DeLEEUW.

It was my pleasure to carry out a line of tests as to performance of milling machines, both as regards feed and speed, at the works of the Cincinnati Milling Machine Company. I found available a great mass of valuable data collected during the existence of this firm, but in order to start with a clean slate and unhampered by past experiences, I disregarded for the time being all these as well as all other data within my reach.

The main points to be settled were:

a. How much metal shall a machine of given size be capable of removing?

b. How much power is required for this work on existing machines?

c. Is it possible to improve on the efficiency of present machines and still produce a commercially successful machine?

d. How much power is required for the feed?

e. What is the efficiency of the feed mechanism?

To determine how much power was required to remove a given amount of metal, tests were made on various machines. The metal to be cut was in all cases, both in these tests and in those to be described later, steel of the following specifications:

Combined carbon	.16 per cent.
Silicon	.008 per cent.
Manganese	.51 per cent.
Phosphorus	.086 per cent.
Sulphur	.041 per cent.
Tensile strength per sq. in.	52378 lb.
Limit of elasticity	30313
Elongation p.c. of length.	50 per cent
P.C. reduction of area	54 per cent.

The test blocks used were 18 in. long, 5½ in. wide and 5½ in. thick. The ends were milled in to provide means for holding the block on the table of the milling machine. In all tests a spiral cutter with nicked teeth was used, 3½ in. in diameter, 6 in. face, and for a 1½ in. arbor. The cutter was driven by a key, and made of high speed steel. All tests were made by driving the machine by an electric motor, belted to the machine. The object was to have all conditions as near as possible to those under which the majority of milling machines have to be run, the only difference being that the belt was nearly horizontal instead of vertical. In testing the efficiency of machines in this way the belt must be considered part of the machine. The power consumed was ascertained by reading of ammeter

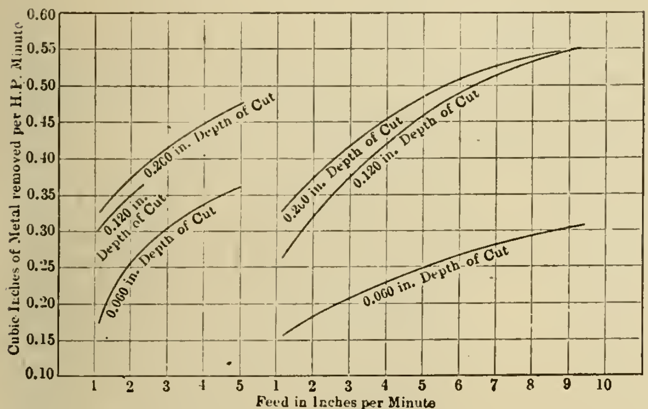


Fig. 1.—Cutting Speed 13 Ft. Per Minute. Fig. 2.—Cutting Speed 32 Ft. Per Minute.

Work of 1 H.P. Min. Measured in Cubic Inches of Metal Removed, Feed Increasing.

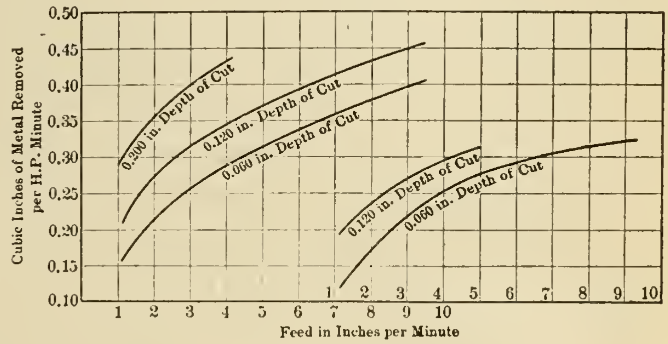


Fig. 4.—Cutting Speed 67 Ft. Per Minute. Fig. 5.—Cutting Speed 150 Ft. Per Minute.

Work of 1 H.P. Min. Measured in Cubic Inches of Metal Removed, Feed Increasing.

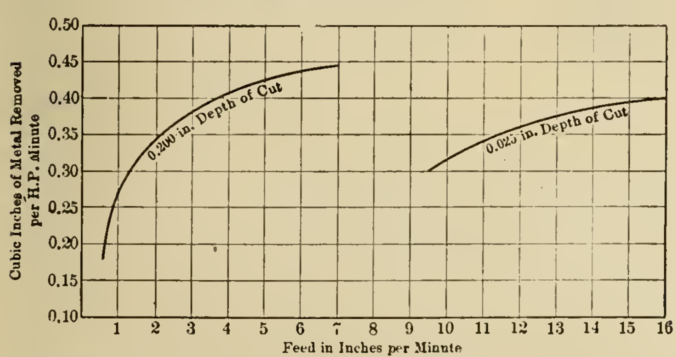


Fig. 3.—Work of 1 H.P. Min. Measured In Cubic Inches of Metal Removed. Cutting Speed 45 Ft. Per Minute, Feed Increasing.

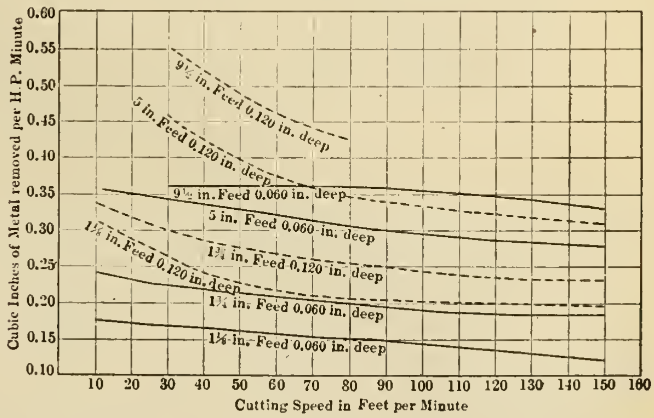


Fig. 6.—Work of 1 H.P. Min. Measured In Cubic Inches of Metal Removed. Cutting Speed Increasing.

* From a paper presented at New York meeting of the American Society of Mechanical Engineers.

and voltmeter, and the amount of metal removed by measuring width and depth of cut and the amount of feed per minute. The amount of feed, as indicated on the index plate of a milling machine, is generally an approximation, near enough for every day work but not for a test. The actual amount of feed was therefore computed from the gearing. In case the feed is a function of the spindle speed, that is, if the feed is expressed in thousandths of an inch per revolution, the feed per minute depends on the number of revolutions per minute of the spindle as well as on the amount of feed per revolution. The exact number of revolutions of the spindle at normal motor speed was determined by computing the gear ratio and pulley ratio. As pulley diameter, the diameter of the pulley plus thickness of belt was taken. This computation would give the spindle speed at rated motor speed and without belt slippage. For this reason the speed of the first driving shaft of the machine was determined by the tachometer at each test. All readings were taken simultaneously.

possible output, this lack of efficiency cannot be held up against the milling machine as a type, for its other peculiarities make it highly efficient as a producer of work. This high efficiency requirement stands by itself. It must be supplemented, however, by other good features, such as convenience, etc.

Power Required to Remove Metal.

The same motor and belt were used for all cutting tests. A series of tests was made with a depth of cut of 1-16 in.; then with a depth of ⅛ in.; then 3-16 in., ¼ in. and ⅜ in. This complete test was repeated four times. The cutter was sharpened in the ordinary way before starting a complete series of tests, and not resharpened during test. The same cutter, resharpened, was then used for the next machine.

For each depth of cut a number of different feeds were used. In all cases the even feeds were used, starting with the second (next to the lowest) and increasing thus: 2nd, 4th, 6th, 8th, 10th, etc., up to the highest feed. It was of course impossible to go through the

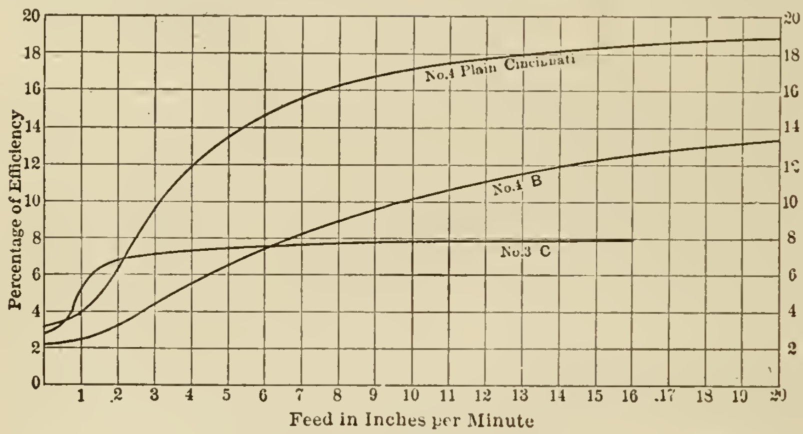


Fig. 7.—Feed Efficiency Curves.

The number of revolutions of spindle and the feed per minute were corrected according to the tachometer reading.

Where the speed of the machine was independent of the spindle speed, that is, taken off a constant speed shaft, and therefore expressed in inches per minute, the same correction was made, as the amount of feed and therefore the amount of metal removed; here again was a function of the speed of the first driving shaft.

These preliminary tests showed considerable differences in the efficiency of different machines, that is, one machine would cut considerably more material than another for a given amount of horsepower developed by the motor. They also showed that the efficiency of all machines was relatively low as compared to the lathe. This latter might have been expected considering the nature of the cutting tool. As the main problem in a machine shop is not to save power, but to get the greatest

entire series with the deeper cuts, as the belt would slip before the last feed was reached. This slippage of the belt was at all times the end of the test for that depth, except where the entire scale of feeds could be used. Readings were taken, when the belt slipped, and they served as a check on the belt tension. It was found that the ammeter readings gradually increased from the first to the fourth series. This was probably due to the gradual dulling of the cutter.

In plotting the curves, the test readings were first corrected: the power readings by means of the efficiency chart of the motor; the amount of metal for loss of speed of the machine. The curve as plotted is the curve of the average value of powers. Where the curve shows an amount of metal removed of say 5½ cu. in. per minute this amount may be due to a depth of cut of 1-16 in. and a feed of 16 in. or to a depth of cut of ⅛ in. and a feed of 8 in., or perhaps a depth of cut of ¼ in. and a feed of 4 in.

The amount of power required to remove a given amount of metal varied with the speed, depth of cut and feed per minute, and seems to have a tendency to the minimum when the section of the chip removed per tooth approaches most nearly a perfect square. Fig. 1, 2, 3, 4, 5 and 6 show curves giving relation between power required and metal removed under different conditions of speed, feed and depth of cut. They are partly derived from the tests described, and partly from tests made for the special purpose of ascertaining these relations. The fact that the power required changes with these conditions of feed, speed and depth of cut made it impossible to plot a single curve giving relation between power and metal removed. Besides, the same speeds and feeds obtainable on one machine were not obtainable on another. And again, the amount of slippage or slowing down of the machine was not always the same for the same amount of metal removed. For this reason the averages have been plotted, and these averages were obtained for the various machines in substantially the same manner. The curves were extended to the zero point, but the high point of all curves is the actual highest average obtained, so that in a certain sense the curves also show the comparison of the greatest possible capacity of these machines. This should be taken as significant, however, only when remembering the conditions under which the machines were tested, and then only as a measure for the maximum driving power.

Power Required for Feed Mechanism.

Tests made by the Cincinnati Milling Machine Company, as well as by other concerns engaged in the manufacture of milling machines, had shown that a considerable amount of power is required for the feed drive of a column and knee type of machine. It was found that as much as 40 per cent. of the total power applied might have been used for the feed alone: and that this could amount to as much as 3½ h.p. on a No. 4 machine. Inasmuch as I did not conduct any of these tests and do not know all of the conditions under which they were made, I do not feel that I can present the results. The main result, however, as far as I was concerned, was the fact that they made me give very careful consideration to the feed mechanism. If 3½ h.p. is used for the feed, and if that feed is 20 in. per minute (the highest feed found on a modern milling machine) then the pressure against the cutter must be

$$\frac{3\frac{1}{2} \times 33000 \times 12}{20} = 69\,[illegible]00 \text{ lb.}$$

if there are no losses in transmission. Further, it is not likely that the greatest amount of horse power is required for the feed at its maximum number of inches per minute. It is more probable that the maximum of feed power is used for 10 in. feed or less per minute, in which case the pressure would be in the neighborhood of 140,000 lbs.

A machine using 6 h.p. net for the drive alone (that is, using 6 h.p. at the cutter) would require about 8 h.p. at the pulley for the drive alone, and therefore a total of $11\frac{1}{2}$ h.p. for drive and feed under conditions of feed mentioned above. This is quite a respectable amount for a No. 4 machine. Assuming the cutting speed to be 40 ft., the pressure at the circumference of the cutter must be

$$\frac{6 \times 33{,}000}{40} = 4950 \text{ lb.}$$

and this must also be the approximate pressure against the table screw instead of 140,000 lbs. Of course all these figures are assumed, but they illustrate the computations which led up to the second line of experiments to be described here.

In order to determine the efficiency of the feed mechanism, the amount of power used was measured, as well as the amount of work done by the table. As the amount of power required varied widely, and it would be impossible therefore to obtain an efficient chart for some small motor, covering the entire range of powers used, the idea of using an individual motor for the feed alone was abandoned. Instead the same motor was used as had been used for other tests. The efficiency of this motor was not known below $\frac{1}{4}$ load. An artificial and constant load for the motor was provided.

In carrying on the test all even feeds were taken, beginning with the second lowest and going up to the highest. For each feed the following pressures were selected: 1,000, 2,000, 3,000, 4,500 and 6,000 lbs. The entire series was repeated once if nothing happened to spoil the test. If something happened to disturb the proceedings, or if something had to be readjusted, then the entire result of the test was dropped and no curve was plotted until two complete series of tests were made without interruption. A sensitive ammeter reading 1-10 ampheres was used. The tachometer served again to take the speed of the first driving shaft, and all corrections were made as in the test previously described. With a given feed, an entire series of pressures was gone through, after which the amount of feed was changed for the new series, etc.

Before taking a series of readings, the feed mechanism was disconnected to get the reading of the dead load. Another reading of the dead load was taken after each series of readings was completed: that is, after all the different pressures had been used for one single feed. One observer took the readings of the tachometer; another of the ammeter; a third of the dynamometer, and a fourth one was stationed at the feed starting lever. The observer of the dynamometer watched his instrument until the pointer reached the proper figure, when he would call out sharply. At this moment all readings were taken and the feed disconnected.

The top line in Fig. 7 shows the curve of average values plotted from the readings of the test on a No. 4 plain miller. Each ordinate is the average of the ordinates corresponding to a certain amount of feed. Precautions to be taken in milling machine construction are: idle running gears, high gear velocities, combined torsional and bending stresses in shafts, and ill supported and floating bearings, and above all, in the use of quick pitch screws.

The importance of a higher efficiency in the feed gearing cannot be over-estimated. It may seem that 20 per cent. efficiency is still so low that it makes little difference whether it is this amount or something else. It may seem at a first glance that it is of little importance to the user whether 80 per cent. or 90 per cent. of the feed power is lost in transmission. But a more careful look at this problem shows the importance of high efficiency very clearly. If 3 h.p. out of 10 are used for feed on a machine of which the feed efficiency is 10 per cent., then 0.3 h.p. is actually used for this feed. If 10 h.p. is used for the entire machine—that is, for feed and drive—then 7 h.p. is left for the spindle drive alone, and therefore the amount used for feed is 3-7 of the amount used for the spindle drive. With a machine having a feed efficiency of 20 per cent. or twice as much, the amount of power used for the feed will be 3-14 of the amount of power used for the spindle drive alone, or 3-17 of the total amount used for the machine. If this amount is 10 h.p. again, then the amount used for the feed will be 1.76 h.p. as against 3 h.p. in the first machine; and the amount left for spindle drive will be 8.24 as against 7 h.p. in the first machine, giving an increased spindle power of 18 per cent. available for cutting. Of the 3 h.p. used by the first machine for the feed alone, 0.3 h.p. is usefully employed while the remaining 2.7 h.p. are employed to wear down the feed mechanism and destroy the machine. Of the 1.76 h.p. used for feed in the second machine, 20 per cent. or 0.352 h.p. is usefully employed, whereas the remainder or 1.41 h.p. is used destructively. It will be seen therefore that the power used to break down the machine is almost twice as great in the first machine as it is in the second.

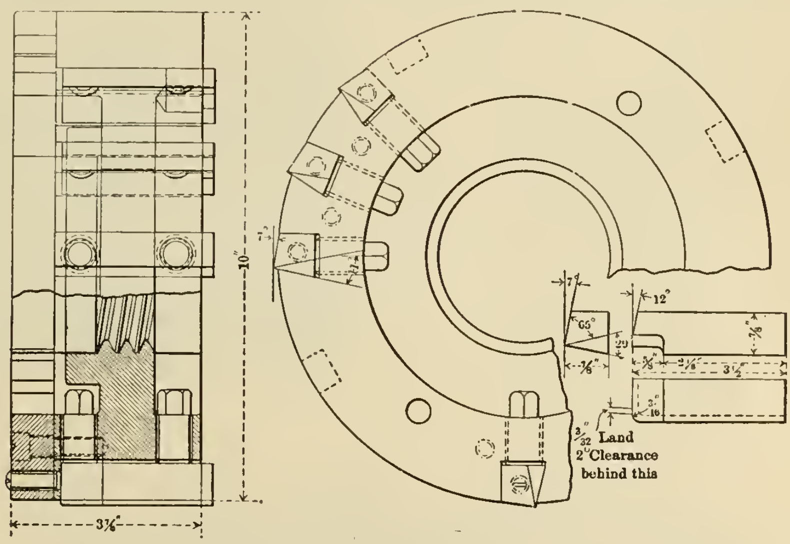


Fig. 8.—10-In. 16-Blade Cutter.

Tests Upon Efficiency of Driving Mechanism.

The third series of tests relates to the efficiency of milling machines as power transmitting devices: that is, the ratio of input and output of power. Some preliminary tests were made by observing the power at the spindle by means of an absorption brake of the Weston type. This gave fairly good results at the higher speeds, the torque being small; but at the lower speeds and with greater torque the action of the brake became jerky and it was practically impossible to obtain reliable readings.

Two machines of the same type, make and size—namely, Cincinnati No. 4 High Power Miller—were placed opposite each other and connected by a stout shaft were used in testing. The feed works were removed, as were also

knee, saddle and table, so that nothing was left but the bare frames and driving works. The machines were placed with the spindles approximately in line. A flange was screwed to the nose of each spindle; each flange was provided with a tongue engaging the groove in the similar flange opposing it, and keyed to the stout connecting shaft. There was plenty of clearance between tongue and groove and also endwise so that the connection could behave as a universal joint shaft in case the spindles were not exactly in line. It must be remarked here that the motion in this universal joint shaft was exceedingly small. Flat pieces of steel bolted to the first mentioned flange prevented the connection from coming apart. One of the machines was driven by a motor while the other drove a generator. The current thus generated was dissipated in a water rheostat, by means of which the amount of current could be closely regulated. There was a set of electric instruments for motor and generator each, so that all readings could be taken simultaneously. Both machines were driven by belts. A tachometer was used to determine if one of the belts slipped excessively. If the generator volt-meter showed considerable drop and the tachometer showed about the proper speed at the first driving shaft of the first machine (motor machine) then the belt to the generator must have slipped. If however the tachometer showed a drop, then the belt from the motor to the first machine must have slipped.

The speed controlling levers of both machines were always in corresponding positions—that is, both were set for the same speed, so that at whatever speed the spindle was running, both driving pulleys were always running at the same speed, and that is the speed at which they are supposed to run under working conditions. Different sets of readings were taken. In one set the current consumed was kept at as near 125 amperes as possible. In another set this amount was 100 amperes; in still another, 80, and in the fourth, 70. Each set of tests was carried out over a number of speeds, namely, the lowest, third, fifth, etc., up to the highest but one.

It would be proper to consider the two machines as of equal efficiency if the conditions of load were the same, for these tests did not attempt to establish the efficiency of an individual machine but of a type of machines and this could best have been done by submitting a great number of these machines to individual efficiency tests and taking the average of the results. It is therefore plain that a better result will be obtained by considering at once the two machines as having the same efficiency than to attempt to determine their individual characteristics. It was said that it would be proper to do so if the conditions of load were the same for both machines, but this did not seem to be the case. The load was the same only at the spindle noses. From there on and up to the driving pulley the load increased in the first and diminished in the second machine. The efficiency of the first machine is made up of the efficiencies of its bearings, shafts, sets of mating gears, etc. These efficiencies may be called e1, e2, e3, etc. The total efficiency of the first machine being E, then E equals e1 multiplied by e2 multiplied by e3, etc. Similarly, taking F as the symbol of the efficiency of the second machine, then F equals f1 multiplied by f2 multiplied by f3, etc. The f's may be assumed to differ from the e's on account of the difference in load.

It was found however on taking the readings that there was such a small difference in efficiency whatever the load, that it seems to be allowable to consider the efficiency as practically constant: in which case the efficiency of each machine equals the square root out of output divided by input. The efficiency of the machine varies from 67 up to 79.7.

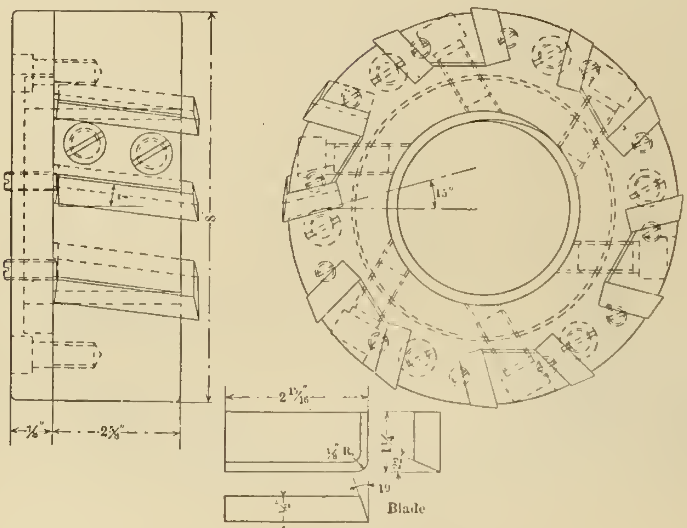


Fig. 9.—8-In. Inserted Tooth Cutter.

Efficiency of Cutters of Different Types.

The milling machine is not essentially less efficient as a power transmitter than any other machine tool, but the amount of metal removed per horse power per minute is low; much lower in fact than for the lathe or planer. Were it not for other properties the milling machine could not compete with either of these two machines.

Cuts made with a spiral cutter with nicked teeth showed a best efficiency of 0.48 cu. in. of metal per net horse power per minute, and this efficiency was obtained only in a few isolated cuts and with a very sharp cutter. Cuts made with a 14 in. face cutter with inserted teeth and on a No. 4 Cincinnati High Power Miller showed a production of 0.64 cu. in. per net horse power per minute, an increase of 33 1-3 per cent. over the spiral cutter. This result confirms the general belief that a face cutter cuts freer than a spiral cutter. The teeth of this face cutter were radial, as it is customary to make them. Tests made with the cutter shown in Fig. 8 showed an efficiency of 0.96 cu. in. of metal per net horse power per minute, and a few isolated cuts even higher. This is an improvement of 100 per cent. over the spiral cutter and 50 per cent. over the face cutter with radial teeth. The cutter shown in Fig. 9 showed the same efficiency. Both cutters have the blade set tangent to a circle concentric with the cutter, thus giving them a rake angle of 15 deg. The clearance was 7 deg. The points of the cutting blades were rounded to prevent injury by burning or chipping, and this reduced the effective rake near the horizontal tangent to this curve. It was for this reason that the blades were set leaning backward as in Fig. 9. But for this curvature at the point of the blades, the simpler construction of Fig. 8 would be perfectly satisfactory.

I regret that the requirements of patent laws do not permit me at the present date to describe a spiral cutter and a face cutter built on different principles, which have been tested as to their efficiency. It may be of some interest however to know that a great number of cuts have been taken with these cutters showing the removal of 1.11 cu. in. per net horse power per minute, and with entire absence of chattering of machine and spring of the cutter arbor.

The Early History of Machine Tool Firms in Canada*

London Machine Tool Company, Hamilton, Has Had a Share of Prosperity in the Past and is Looking Forward with Enthusiasm to Future Development.

The machine tool business is one which has made considerable progress in Canada of late years and its future appears exceptionally roseate. The machine tool business owes its bright outlook to industrial expansion, of which there is a great promise. For railroad shops, machine tool equipment is one of the essentials. Among the early builders of machine tools in Canada, who are now manufacturing on a large scale, is the London Machine Tool Co.

Fig. 1.—London Machine Tool Co.'s Plant, London.

The president of this company is William Yeates who has been in the machine tool business for over twenty-five years and is probably one of the best known machine men in the Dominion. He started business in London about 1872, building engines, boilers, saw mills, and grist mills. He was then in partnership with Mr. White. The partnership between Messrs. Yeates and White was dissolved in 1876, and Mr. Yeates continued this business, manufacturing power equipment until 1888.

When the Gibson Company, Seaforth, failed, Morrison Bros. bought the plant. The Gibson works consisted of the old Thomson & Williams plant. Morrison Bros. required some machine tools. They came to Mr. Yeates and asked him to build them some tools. Mr. Yeates had bought a long planer from Gibson and was, therefore, in a position to do that class of work. Morrison Bros. furnished a number of patterns and small sizes of lathes and planers were made. This was the beginning of the machine tool business of the London Machine Tool Company.

Having had good success in turning out machine tools, Mr. Yeates saw the necessity of enlarging the plant and increasing the lines of machine tools. Ultimately the power equipment part of the business was dropped and it developed into a machine tool factory building all the tools required in the modern machine shop. On account of the increase in business, the prospects for a still larger demand for tools and the small quarters of their first plant they bought the Elliott Works on Bathurst St., London.

In 1905 the foundry was burned owing to a fire in the lumber yards of the Diamond & Baker Company. Mr. Yeates felt that the present quarters were still too small and set about securing larger premises. He bought fifteen acres in the east end of London, then the news of the fire was spread abroad and many municipalities wrote him to come and see what could be done towards having them locate in another town. The Diamond & Baker Co. bought the premises of the London Machine Tool Co. in London, so Mr. Yeates decided that it would be advisable to move to Hamilton. In 1906 the company occupied the present premises which are well fitted to handle all the lines of machine tools.

In Fig. 1 is shown the front view of the works on Bathurst St., London. In Fig. 2 is shown a bird's eye view of the present plant. The large foundry shown has not yet been built but plans and specifications have been prepared and all arrangements made for its erection next year. When this is completed, the London Machine Tool Company will have one of the best modern and complete plants in Canada.

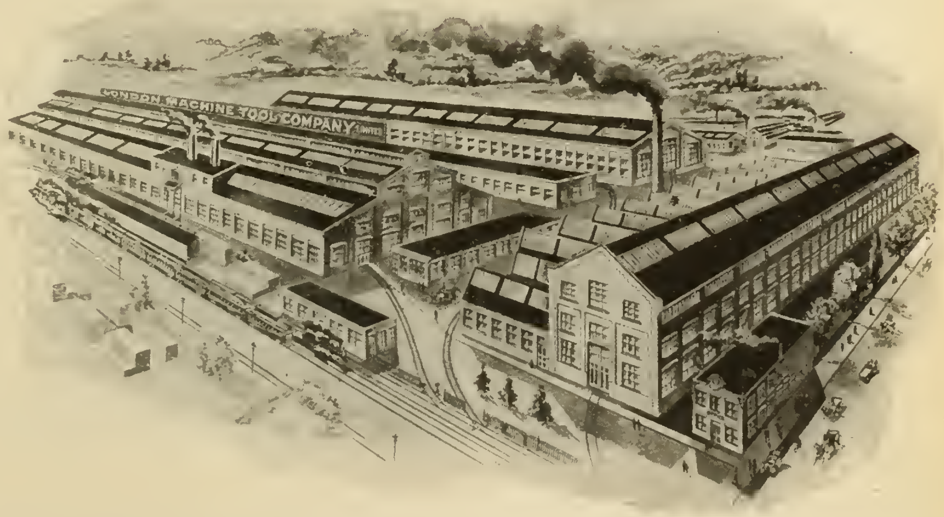


Fig. 2.—The Buildings on the Right are Erected. The Foundry on the Left Will Be Erected in 1909.

Mr. Yeates' Apprenticeship.

Mr. Yeates served his apprenticeship with David Bruce, London, commencing

*The first article on early machine tool firms was published in the November issue.

in 1861, and remaining in his employ for five years. David Bruce manufactured engines and power equipment. As David Bruce was a first-class mechanic, Mr. Yeates obtained a thorough knowledge of engines. Ever since the time of serving his apprenticeship he occupied positions of responsibility and trust, until he went into business himself in partnership with Mr. Joliffe. Afterwards Mr. White was taken into the business. Then Mr. Joliffe died and Mr. Yeates was left in charge. He afterwards retired in 1876, leaving it in the hands of Mr. White, who still carries on the business under the name of the White Engine Works.

The second generation are grown up around the works and are taking an active interest in it along with Wm. Yeates. The general manager is E. J. Yeates, who is technical as well as practical man and superintendent of the works. The drafting department is under the charge of P. M. Yeates. This year an Eastern office was opened up in Montreal and is in charge of Roland Yeates.

AN UNUSUAL TYPE OF DREDGE.

Not being satisfied with the performance of one 1½-yard dipper dredge and its attending fleet of six scows and a tug boat, it was thought worth while to make an effort to combine dredge, scow and tug boat in one hull, under the control of one crew. The machine illustrated is the result.

This dredge has been running now for some months and has proved to be a very cheap type of machine to operate as well as build. It is running between 12 and 15 trips per day of 10 hours, over a course of 3 miles out and back to the dumping ground, over 20 miles in all per day, carrying a load of approximately 35 to 40 cubic yards per trip, her crew consisting of three men, viz.: engineer, fireman and deck hand. These men also put aboard their own fuel, about two cords of wood per day. The daily expenses of the whole are under $8 for the dredging and towing out of 200 to 240 cubic yards per day, after allowing for depreciation, repairs, etc. The cost of dredging with this machine approximates 5 cents per cubic yard when working in hard sand or clay.

Fig. 2—Emptying the Bucket.

As shown by the illustrations, the dredge is of the orange-peel; twin-screw; self-dumping hopper type, length, 55 feet, beam, 15 feet, draft, 40 inches, driven by a pair of 9"x9" engines, turning 40" wheels.

Some hesitation was experienced in deciding to use the trolley and "I" beam with which to operate the bucket, rather than the usual derrick and boom. The present performance of the trolley justifies its use, the bucket being able to make the round trip in 10 feet of water, in from 30 to 40 seconds. This, I believe, is much faster than could be obtained with a derrick and boom.

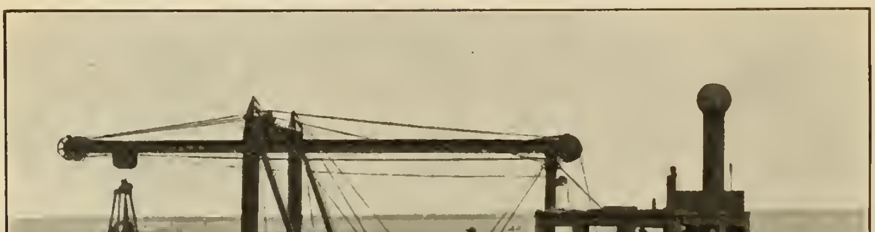


Fig. 1—Bucket Ready to be Lowered.

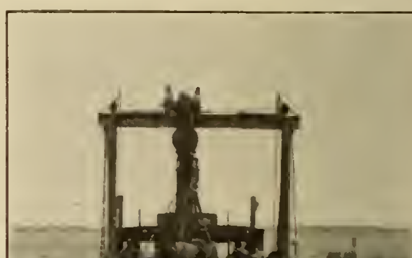


Fig. 3—End View of Dredge.

The bucket is operated by a pair of 7"x14" double-drum hoisting engines with swingel mounted on the extension of one of the drum shafts, the traverse for the trolley being obtained by the opening and closing ropes.

The engine on the opposite side of dredge is kept slowly turning either ahead or astern, thus swinging the end of boom through an arc of about 60 feet radius, the swinging movement being under the control of the deck hand, leaving the engineer free to operate the bucket. The hopper is 20 feet long by 8 feet wide by 7 feet deep to the bottom of side boards, and holds approximately 40 square feet.

This machine overcomes many objections to the dipper type of dredge for small dredging jobs. First, for shallow dredging of say 10 feet, the bottom is left smooth rather than the heavy bank left on either side of cut by dipper dredge; quickness with which machine can be got into place and worked in channels that are almost continuously being used; small amount of labor required; three men at approximately $6 per day; low initial cost, being about one-fifth of the amount required for dredge, scows and tug boat to haul the same amount of material the same distance.

One pleasing feature is the ease with which the dredge can be handled, due principally to the twin screws. This machine was designed by the writer and built in the shops of McLachlin Bros., Ltd., of Arnprior

The Urgent Necessity for Technical Education in Canada

A Consideration of What is Being Done by Our Three Large Universities—Technical Education for Mechanics, and What Might Be Accomplished if Technical Schools Were Established and Properly Equipped.

McGill, Queen's and Toronto Universities have taken such a hold on our national life that we can point with pride to the work being done by these three great national educational institutions. Many other universities and colleges throughout Canada are also doing a good work towards the elevation and education of Canada's population. It is the engineering courses of these three universities, however, that probably interest the manufacturer, the mechanic and the engineer most.

Graduates in civil, electrical, mechanical, mining, chemical engineering and architecture are occupying import positions not only in Canada but in the United States and other countries of the globe. The manufacturer asks what interest is this to him. The great railroads with their bridges and tunnels are the work of the civil engineers. Transportation is an important problem with the manufacturer. His power house equipment requires the mechanical and electrical engineer. The ore is brought from the mine and prepared for his use by the mining engineer and the chemical engineer keeps the foundry irons and steels of proper composition to manufacture castings for the various works for which they are intended. The architect designs for the manufacturer an economical plant. The majority of improvements are due to the study made by the graduates of our engineering colleges.

Railway Engineering

Transportation is an important problem, and at McGill University, Montreal, a course is given in railroad engineering. The G.T.R., C.P.R., C.N.R. and Government railways contribute to the cost of providing instruction in the Department of Railways. This course is designed for students who will enter (1) Operating department or executive offices, (2) mechanical department, (3) engineering department.

A course is given in economics with special reference to the organization of modern commerce and industry, railways and their developments, transportation, railway rates, taxation, etc. Railroad law gives an outline of the law of use to business men, with a detailed study of law affecting railroads. Railroad engineering deals with the history of Canadian railways, surveys, grades, estimates, switches, crossings, yards, terminals, interlocking, block signalling, maintenance, tools, etc. Other subjects of the course are drafting, telegraphy, accounting and railway organization, structural engineering, railway mechanical engineering including locomotive design and construction, fuel handling, equipment, etc.

The transportation course has been developed with a view to making the men of immediate use to railway companies without sacrificing the theory which will sustain the student in responsible work.

The Canadian Railway Club, Montreal, give a scholarship in connection with this course. It is awarded as a result of a competitive examination, open to sons of members of the club. Bruce Robb, son of W. D. Robb, Supt. Motive Power, G.T.R., Montreal, has been awarded the first scholarship given by the above club. This consists of the sum of $200 per year for four years at McGill University. The G.T.R. and C.P.R. have similar scholarships open to sons of employees. A portion of the time must be spent in one of the shops during the vacations, and these companies expect the student, at the completion of his term to stay two years in the company's service.

Shop Work.

During a science student's university course he is instructed in wood working, forging, foundry practice and iron working. This is not with the idea of making artisans, but to give the students an insight into practical methods. At Queen's University this practical training, both in the shops and power plant, is supplemented by practical demonstrations at the various works in Kingston, including the locomotive works, dry dock, cotton and spinning mills, etc.

The long summer vacation gives the progressive students the chance to increase their practical training. This is taken advantage of by a great many and the knowledge obtained in this way fits them for more rapid advancement in designing and the various fields of engineering.

These universities fill their field, but an intermediate school between that of the public and high schools and the university is necessary. Schools are required to keep in closer touch with the mechanic. The graduates in these schools would be of most immediate use to the manufacturer. The mechanic would then have both theory and practice together and the tuition will be thorough. Technical education as applied to agriculture has made the Canadian farmer the envy of the world, and the application of it in a similar manner to other lines of industry will put them on the same plane. A thoroughly practical and broad-based system of technical education is needed.

Technical Education in Germany.

There is no nation in the world that gives greater encouragement and opportunity to its people to become skilled artisans than Germany. Municipal, State and the Federal Governments all contribute to the establishment and support of technical and industrial schools, and there is scarcely a city or town of any importance where one of these splendid institutions is not found.

Any law or regulation that tends to encourage and lift up laborers and mechanics to a higher degree of proficiency finds ready and hearty indorsement. The department of interior of the imperial ministry of Alsace-Lorraine has arranged the following courses of instruction for those workmen who desire to attain that degree of proficiency which will entitle them to be called masters in their respective trades.

It must be understood that the applicants for these masters' degrees are practical and skilled workmen, with years of experience in their different lines of work, and by means of these tests are ambitious to become recognized as finished artisans. For instance, a tailor who has successfully passed such a test will be known as a master tailor, and, since such distinction means a great deal to a workman in Germany, the artisan eagerly strives to attain that proficiency when he is recognized as a master of his trade.

Six Practical Technical Courses.

Besides the excellent trade schools and the necessity of long apprenticeships, which train the journeymen of Alsace-Lorraine, the ministry at Strassburg has made possible the following courses:

(1) A master course for bookbinders, upon the completion of which the workman is known as a master bookbinder. This course is conducted in Strassburg by an expert instructor from an industrial school of North Germany. Instruction is given in the details of binding

books, especially the different color effects, artistically cutting the paper — square cornered or round—the art of putting the leaves together in such a way as to insure greatest symmetry and durability; the tasteful decoration of the cover; the study of the different kinds of binding, such as leather, half-leather, morocco, cloth, paper, etc.; what bindings are best suited to an atlas or album; the study of attractively indicating the title of the book; the best method of dividing a large work into volumes. Besides these practical phases, lectures are given and exhibitions are made of the best products in the art of bookbinding.

(2) In the courses for tailors, most of the attention is devoted to the instruction in cutting and fitting, the drawing of the latest patterns, etc., as well as the studying of the quality of goods and color effects.

(3) The master course for painters consists of practical lessons in wood and stone painting, proper shading, and the painting of figures, signs, and other artistic work. Exhibitions are also made in different public places, when the painters' names are indicated, and in this way serve, in a certain sense, to advertise their work—though that is incidental.

(4) A master course for locksmiths, mechanics, plumbers, and tinners is given in the fundamentals of electricity, building, and insurance requirements, as well as the proper wiring of buildings, the putting in of telephones, different methods of lighting—gas or electricity. Practical illustrations are taken from model houses and buildings.

(5) A master course for cabinetmakers in which the latest tools, different kinds of wood and their respective uses, and practical work in polishing, staining of wood, as well as the study of the latest material in the finer lumber for such work.

Further, each participant must be able to sketch a model workshop, figure out the cost of the raw material compared to the finished product; and visits are made to the art museums and large furniture establishments.

(6) Similar courses are given for paper hangers, decorators, potters, carpenters, well diggers, and all workmen where any skill is required.

President Roosevelt on Education.

"Progress," says President Roosevelt, "must consist in the development of physical labor so that it shall represent more and more the work of the trained mind in the trained body. To provide such training, to encourage in every way the production of new men whom it alone can produce is to show that we have a true conception of the dignity and importance of labor. The printer, the electrical worker, the house-painter, the foundryman should be trained just as carefully as the stenographer or drug clerk. They should get over the idea that to earn $12 a week and call it salary is better than to earn $25 a week and call it wages. The young man who has the courage and ability to refuse to enter the crowded field of the so-called professions, and to take to constructive industry is almost sure of an ample reward in earnings, in health, in opportunity to marry early and to establish a home, with reasonable freedom from worry. We need the training, the manual dexterity and the industrial intelligence which can be best given in a good agricultural, or building, or textile, or mechanical school. It should be one of our prime objects to put the mechanic, the wage-earner who works with his hands, and who ought to work in a consistently larger degree with his head, on a higher plane of efficiency and reward, so as to increase his effectiveness in the economical world. To train boys and girls in merely literary accomplishments to the total exclusion of industrial, manual and technical training, tends to unfit them for industrial work, and in real life most work is industrial."

Industrial Schools in Montreal.

Two distinct school systems exist in Montreal, Protestant and Roman Catholic, each with their own board of commissioners, with commercial and technical high schools. These schools are for boys, where they become acquainted with different tools and their uses.

The Technical Institute has developed technical evening classes and is chartered by the Provincial Government of Quebec. The Protestant Board of School Commissioners has granted to this technical institute the free use of its new commercial and technical high school building and its laboratory equipment. It also co-operates with them in conducting evening classes.

The classes are for a term of twenty weeks. An entrance fee of $2 is charged and in some cases, such as metal work, an additional fee, not exceeding $3, to cover the expense of material used. These classes are managed by a board of management chosen from both the Protestant Board of School Commissioners and the Montreal Technical Institute.

This is the first year that these classes have been open, but the men of this city have been very quick to see the advantages of technical education along with their practical work, and the accommodations of the building are taxed to overflowing.

At the Montreal Y.M.C.A., class instruction, lecture and demonstration is given in boiler firing; boiler, engine and machine design; mechanical drawing and mechanical engineering. Some features which are considered in detail are estimates, operating and construction costs, fuel savings, smoke prevention and kindred appliances for increasing efficiency and economy. The classes are held for firemen, engineers, mechanics, draftsmen, etc., and Peter Bain, consulting mechanical engineer, has charge of this department of the association's work. These are evening courses, but the lack of laboratory equipment is keenly felt.

The G.T.R., under the supervision of James Powell, chief draftsman, have an educational course in conjunction with their apprenticeship course covering their whole system. This was fully described in the March issue of Canadian Machinery.

Technical Education in Toronto.

The courses in Toronto Technical School include general culture courses and three-year courses in drafting, electricity, mechanics, etc. There are also business courses, fitting men for office work. This school has 678 students in the daytime and 1,300 in the evening. The accommodation and equipment is far short of what it should be for a city like Toronto. The governments and school boards should be impressed with the necessity of providing education for mechanics. Not one-quarter of high school graduates enter the professions and the others should be considered. A city of 300,000 should have a school to accommodate at least five thousand students. There should be education for all who want it. An equipment of engines, pumps, boilers, wood and iron working machinery is necessary to illustrate the principles. At present the unsatisfactory method of blackboard illustration is used.

The central branch of the Toronto Y.M.C.A. have two departments in electricity and mechanical drawing, for young men who wish to qualify as master mechanics, foremen and draftsmen.

For the most part mechanics and foundrymen in Canada learn the practical work in the shop and pick up the principles in a haphazard sort of way. This isn't fair to the men or Canadian industries. Only when properly equipped technical schools are established throughout the Provinces in manufacturing towns, where theory and practice can be learned together, can Canada hope to produce mechanics to equal those of other nations. Only then will the industrial institutions be on the same plane with the farming industry.

A technical school cannot produce mechanics, but the knowledge of mechanical principles can be taught in conjunction with his practical work in the shop. An apprentice thinks he is losing time if a manufacturer keeps him at one job on a drill press for three

months at a time. If he can attend a technical school, however, he does not look upon it as wasted time, but is preparing himself to be a better mechanic when he is given other work to do. The manufacturer is benefited by the work being done better and more quickly.

Libraries for Artisans.

Mr. T. W. H. Leavitt, Inspector of Public Libraries for Ontario, states that the Library Department is preparing a series of special libraries for artisans and mechanics in industrial centres such as Berlin and Niagara Falls. One of the libraries will be at Sarnia tunnel. The object of the libraries is to give the artisans and mechanics the benefit of a technical education in their trades.

Essentials Necessary.

Universities and technical schools cover two distinct fields. The universities take boys and train them to fill positions involving designing and engineering without the necessity of skilled manipulation. The technical schools give the principles and theory of work in the workshop and foundry and fit them for the work in manufacturing plants.

In the General Electric, Westinghouse and other large industrial institutions special apprenticeship courses are given for graduates in science from universities, to fit them for managing positions in their lines of work. With the technical school the practical and theory go together and this is looked upon as more satisfactory where the scheme has been in use. In these schools men will be trained with shop work in view and will take positions in the foundry and machine department.

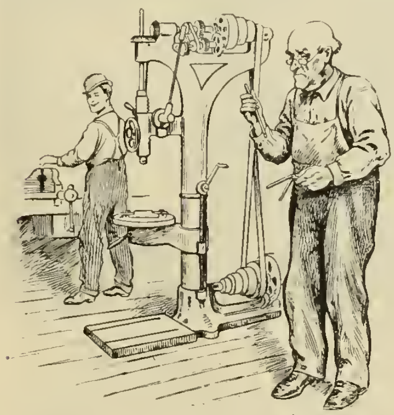
Technical schools should be established at industrial centres. To make them a success the schools must be in practical hands. Teachers must be practical men. He must know his mathematics and how to apply them. The time of giving examination papers filled with catch questions is past. Practical, every day questions should be discussed. It will not do for a teacher to pass through public school, high school, and college and then become a teacher without any practical training. He must know what he is teaching from a commercial point of view so that the students will receive the most useful knowledge. The men on the school board must also be practical men.

Technical education must be carried out in a businesslike, systematic way. The Dominion Government should take hold of the scheme, co-operate with the Canadian Manufacturers' Association and other associations interested in it and evolve a scheme of technical education equal, if not superior, to that of Germany and the United States. The Federal Government has assisted education by conducting an engineering course in Kingston, contributing towards the railway course at McGill, Montreal, and has shown a direct interest in educational problems. The Premiers of the various Provinces are willing that the Federal Government should take up the question. The constitutional difficulties involved investigated, plans can, no doubt, be prepared to surmount them and technical schools be made a part of the national industrial policy.

In the November issue of Canadian Machinery was described the industrial course in Fitchburg High Schools. In a succeeding issue will be given the system followed in other technical institutions.

HOW BILLY CAME TO USE TWIST DRILLS.

It was mighty difficult for old Billy Brown to give up his belief that a well forged and ground flat drill was not superior to a twist drill. He had been using flat drills for 40 or 50 years, beginning, in fact, long before the twist



"What is the darn thing?"

drills were originated, and when the younger hands came up and began to talk to him about some improvements of this or that kind, Billy Brown would smile in a superior way and explain to them that he was experienced in the business long before they were born. In particular, the flat drill was one of Billy Brown's hobbies, and unless the force of circumstances prevailed, he would never consent to use a fluted twist drill. Billy had been working in this same shop for so many years that he had become something of an old inventory, and the boss did not care much about Billy's queer ideas, particularly as he was a pretty good tool-maker, notwithstanding his opposition to new wrinkles. Billy's favorite boast was that no one in the whole shop could grind a flat drill just as he did it, as none of the others had the experience, because of using these new-fangled drills. Billy's boasting finally led to his downfall, and as usual a shop "kid" was the cause.

It happened one day that Billy was going to drill a ¼-inch hole on the upright drill press, and while he was grinding his drill, young Jimmy Smith went up to Billy's machine and crossed the driving belt. Billy put his drill into the socket and started off drilling, but, to his dismay, he found that his drill would not cut. The reverse motion of the drill spindle was not very apparent, because of its high speed, and then, too, Billy's eyesight was not as good as it was once. He hardened his drill again, and ground it very carefully, put it in the drill press, and still it would not work. A thing like this had never happened to Billy before, and he began to worry about not being able to grind a flat drill so that it would cut.

He finally hardened his drill for another trial, and ground it even more carefully than before to the angles that had never failed him before, but strange to say, the drill still would not make any impression whatever on the piece of work. Then he tried the work with a file to see whether it was not hardened, but it was nothing but ordinary soft machine steel. Then he tried the drill with his file and found that it was just as hard as it could be, so the fault evidently must be with the grinding of the drill. Then Billy totally lost confidence in himself, and went up to one of the younger men, explaining to him his troubles. Jimmy, the innocent, who was always around when he was not wanted, came up and looked at Billy's drill, and said: "Why, Billy, of course that drill wouldn't cut. Don't you see you haven't ground to the right angles?

I won't try to repeat what Billy said to the apprentice, for that would not look good in print, but Jimmy, unabashed, snatched the drill from Billy and ran over to the grindstone, pretending that he was grinding the drill to its proper angles, while, of course, he left the cutting surfaces undisturbed. During this grinding operation, however, somebody kindly put the belt right again on the drill press, and Jimmy, placing the drill in the socket, fed it down and it cut through the piece of work as though it were butter. Billy stood dumbfounded, and that noon he went up to the foreman and said: "I guess I am getting too old to work in the shop." The foreman, however, who by this time had heard the story of Billy's trouble with the drill, persuaded Billy that he could not spare him, and Billy, greatly gratified to hear that, concluded that thereafter he would use a twist drill, and now Billy thinks that twist drills are far superior to the old flat drills.—Machinery.

Magnalium: Aluminum Alloy of Remarkable Properties

Weight, Strength, and Its Various Uses—Description of Methods Employed in Machining, Molding and Working the Metal, and Its Peculiarities

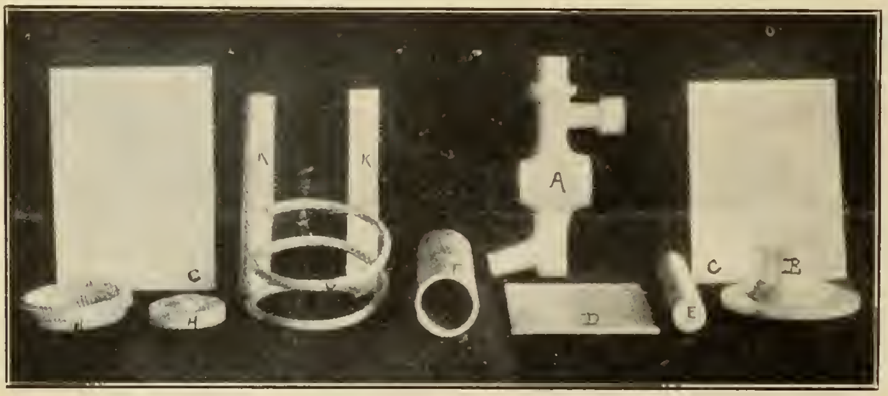
One marked advantage that aluminum has is its low specific gravity, or in other words, its lightness. This property made it a desirable metal to use in the manufacture of such articles that required lightness, but it was soon found to be too soft for the majority of cases. To overcome this defect and to impart to the metal those other properties which are desirable, such as elasticity, strength, density, etc., a great many metals have been tried as alloying materials. The majority of these increase the specific gravity of the alloy and so discount to a certain extent the advantages gained by using the light metal. The specific gravity of pure aluminum is 2.64 and the alloys heretofore in use have specific gravities ranging from 2.85 up, according to the amount of alloy used.

A German company has lately put on the market a new alloy of aluminum called magnalium. This is composed of from 90 to 98 per cent. aluminum and the balance mainly magnesium, with a little antimony and one or two other ingredients to make it draw, roll or cast more easily.

It is obvious that, on account of magnesium being lighter than aluminum, the specific gravity of the alloy will be less than that of aluminum. It ranges from 2.40 to 2.57, according to amount of magnesium used. Plates made with proper care will show a tensile strength of about 50,000 pounds for the hard rolled, and about 40,000 pounds for the annealed.

Drawn into wire the metal gives a tensile strength of about 50,000 pounds per square inch for small sizes. As the diameter is increased this tensile strength rapidly diminishes. In tests a wire 0.079 inch diameter showed a tensile strength of 50,500 pounds, with an elongation at rupture of 2.13 per cent.; a wire 0.118 inch diameter showed a tensile strength 43,800 pounds, elongation 0.61 per cent.; another wire 0.197 inch diameter showed 39,500 pounds, elongation 2.5 per cent. Sand castings showed tensile strength of from 18,400 to 21,300 pounds per square inch, while chilled castings show from 22,700 to 25,600 pounds.

The accompanying table is interesting as a comparison between magnalium and a few of the other metals. The third column of figures is obtained by dividing the tensile strength in pounds per square inch by the specific gravity in each case. For instance, if one metal were three times as heavy and three times as strong as another, this would give equal factors and weight for weight, the metals are equally strong.



Magnalium Sheets, Wire, Tubing, Rods and Forgings.

Metal	Spec. Grav.	Tensile str. lbs. sq. in.	Tensile str. lbs. per unit spec gr.
Cast Steel	7.8	78,233	10,030
Wrought Iron	7.0	49,781	7,112
Copper	8.8	31,293	3,556
Aluminum Bronze (10 p.c. aluminum)	7.3	90,324	12,373
Magnalium Sand Castings	2.50	18,491	7,396
Magnalium Chilled Castings	2.51	22,759	9,067
Magnalium Forgings	2.51	28,418	11,334
Magnalium Drawn Wire	2.57	41,000	15,564
Magnalium Drawn Rods	2.56	60,000	23,438

The uses of magnalium are very diversified, a few of the many being, airships, automobiles, marine gas engines, kitchen utensils, radiators, brewers' utensils, articles for army and navy use, surgical instruments, telegraph, telephone and wireless telegraph apparatus. One of the uses for magnalium is in the form of wire or cable for electric power transmission. On account of its lesser electric conductivity, which is 56 per cent. of that of pure copper, a larger diameter wire is required to carry the same current. However, as copper is 3.58 times as heavy as magnalium and only 1.786 (1 divided by 0.56) times as conductive, the weight saved would be in the ratio as 1.786 is to 3.58, or about 1 to 2. In itself this will not show a marked economy in price of the bare wire, but, because of its greater tensile strength in connection with its lighter weight, the spans can be from 2 to 3 times as great, which would save not only a large expense in poles or towers, but considerable in leakage, as the leakage always occurs at the point of attachment to the pole or tower.

Magnalium is best melted in ordinary graphite crucibles, care being taken that the crucibles are perfectly clean. A crucible that has been used for brass would have enough brass adhering to the carbon in the crucible to utterly destroy the properties of the cast magnalium. It is, therefore, suggested that a brand new crucible be used if possible, especially for testing this metal as it is probable that with a new crucible which has never been used for any other metal, better results will be obtained from magnalium castings.

The metal must not be heated further beyond its melting point than necessary (about 1,200 degrees F.), which is about a third less than brass. That is a nice red heat, a higher heat such as orange produces porous castings of a gray color and must be avoided.

The temperature should be kept as even as possible. The crucibles should

be evenly surrounded with coke and should rest on a fire-proof support. The support is necessary to keep the crucible from direct contact with the grates and to keep from cooling the metal by an airdraught after the coke burns up. The lid remains on the crucible to prevent contact between the air and furnace gases and the metal. In order to prevent oxidization, it is often advisable, while the metal is being melted, to sprinkle finely powdered charcoal over the metal in the crucible. When fluid it can be stirred with a clean pine rod. As soon as the metal ceases to cling to the rod the crucible should be removed from the furnace and placed on some warm fire-proof support such as an iron sheet, to prevent the metal chilling from the bottom before it is required, then allow the metal to still and pour it into the mould steadily and without cessation, carefully skimming and holding back the slag and oxidized skin with a skimmer, keeping the crucible close to the grate until this overflows. The metal should enter the mould from the bottom and the clearance and scum are allowed for by the rising prolongation of the mould. No flux is necessary. In spite of its low melting point it should take from 43 to 45 minutes to melt.

In making sand moulds, the sand is loosely pressed and should have as many air holes as possible; take special pains to prick well through the sand with pieces of wire while the pattern is still in, in order to allow all the air that may be carried into the mould with the molten metal to escape and thus preclude all possibilities of blow holes or porous castings. In this connection it may be advisable to mix the moulding sand with 10 per cent. of metal. The sand must not be rammed as close as for brass castings.

The grate should be cylindrical, the entrance should be wide and the casting funnels and the risers must be wide at the base and narrow at the top, to allow the air and gas to easily escape. The oxidized skin and slag will rise and the finished casting will be free of pores or blowholes. As soon as the metal is sufficiently cool the casting heads are broken off and the flasks are loosened. For castings in an iron mould the liquid metal must be hotter than is the case for sand castings, and the mould should be well heated.

When melting scraps, chips, turnings, etc., the larger pieces should be melted first, then the crucibles should be removed and the borings, turnings, etc., be added, as otherwise the loss due to burning is too large. When melting large pieces this loss is not more than from ½ to 1 per cent., the loss in melting borings and file dust is as much as 10 to 15 per cent.

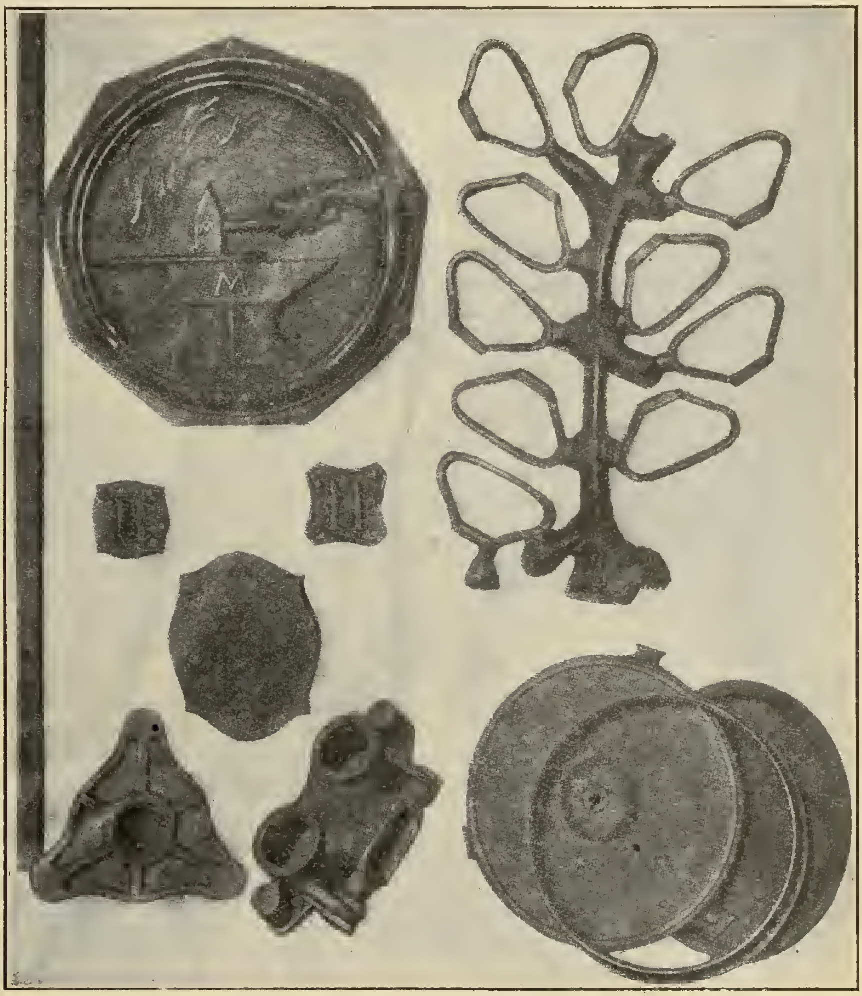
In damp sand the metal should be cast quickly and at as low a temperature as possible. In dry sand or chills the metal should be bright red, and should be cast slowly. Ingots must be cast in closed metal moulds with planed inner surfaces. The moulds should be well cleaned before using, brushed with graphite and well heated. Castings in sand should be cooled quickly, preferably in cold, flowing water, this treatment making the metal very tough and ductile. The casting shrinkage is from 1¾ to 2 per cent.

If magnalium is overheated it absorbs oxygen and becomes spoiled and porous. Anyone accustomed to brass has a tendency to overheat magnalium and care should be taken especially by such persons to work magnalium at as low a heat as possible. This applies not only to melting and casting but to forging and any other operations that require heating of the metal.

The metal flows easily in the mold and fills all the fine depressions as is shown by the illustrations. These are magnalium castings just as they left the molds. In the other illustration A and H are sand castings, B is a forging, F a seamless tube, G a wire spring from a stiff mixture, C and D are rolled sheets, and E and K are drawn rods.

Magnalium is readily adapted for forging, either drop forging or with the hammer. The metal should be heated to about 626 degrees F and then worked about the same as Swedish steel. At this temperature it will not glow red but will char a piece of wood. The casting should be well cleaned before forging, to show up any cracks in the metal. It is advisable to pickle the piece before rolling or forging by putting it first into a warm 10 per cent. solution of caustic soda, to which 2 per cent. common salt has been added. From 15 to 20 seconds is enough time in this solution, after which the piece is rinsed in water, brushed and dipped in concentrated nitric acid for 10 to 15 seconds, then rinsed in cold water and dried in warm, finely powdered sawdust. All faults in the casting can then be easily seen and removed by scraping and sandpapering. A dull, silver white frosted surface with a silky gloss is formed by several "picklings" and this surface is not affected by changes in atmospheric conditions.

Magnalium being very ductile can be rolled into plates of almost any thickness. As the metal rapidly loses its ductility in rolling, it has to be repeatedly annealed, ingots thicker than



Magnalium Castings as they Come from the Mold.

0.15 inch having to be annealed after every pass. The power necessary to roll magnalium is about the same as that required to roll heated steel, although the rolling is more easily accomplished if the rolls are heated to a temperature of from 210 to 300 degrees F. Plates thinner than 0.15 in. can be cold rolled.

To anneal plates a high temperature is not required, and the thinner the plates the lower will be the necessary temperature. They should be annealed in an even heated muffle furnace, to keep the flame and gases away from the metal, and heated to a dark red that will char a pine stick so the carbon particles will separate from it. If chilled in cold water they will be very tough and ductile. Plates less than 0.01 inch in thickness can be annealed by heating in boiling oil or water, and then allowed to cool slowly, but thicker metal must be quenched to anneal them.

If the metal is gradually heated to about 750 degrees F. and slowly cooled it gets so hard and elastic as to be easily worked into springs. Magnalium is easily machined at high speed, about like steel, and screw threads can be easily and cleanly cut. The tools, however, should be kept well sharpened and both the piece and cutting tool well lubricated. To cut magnalium, a fine-tooth saw lubricated with kerosene is recommended.

Magnalium can be soldered, although not readily. The operation requires a certain amount of "knack." The metal must be scraped, cleaned and immediately tinned with a special magnalium solder, no flux being used. As a thin film of oxide is liable to form on the surface of the metal, it is advisable to rub well down through the melted solder so as to thoroughly scratch the real surface underneath. When the "tinning" is properly done the surfaces are pressed together and heated until the solder flows and when cooled a good strong joint results. On account of the high thermal conductivity, the heat required for actual soldering is liable to flow all over the metal, thus preventing the flow of the solder. It is, therefore, wise to keep a heated surface such as a hot iron plate under the parts to be soldered.

If carefully handled magnalium can be welded by an oxy-acetylene flame. In certain forms, such as tubing, wire and rods, the metal will not be as strong at the welded joints owing to the fact that the fusing under the blowpipe changes the character of the metal somewhat, but careful reinforcing will bring it back to nearly its original structure. This is not the case though in welding castings, as here the welding is simply a fusing together of the parts.

To get the desired effect from the raw material great care must be exercised in the various operations from that to the finished product so that it cannot be called a cheap metal. This, however, is offset by its lightness and the fact that it is much stronger in all cases than aluminum, so that lighter sections may be used without sacrificing strength.

Magnalium is very little affected by corrosion, alkaline solutions having the greatest effect upon it. It shows almost no magnetic influences and as its thermal and electric conductivity is 56 per cent. that of pure copper, it will probably take the place of copper and brass under conditions in which aluminum would have been used long ago, if it had not been for its softness and other unfavorable qualities.

The various alloys of magnalium are as follows:

Alloy Y. is adaptable for castings of every kind and is very easily worked. It is elastic and has universal application. Its whole structure closely follows that of yellow brass. It can be cast in sand or in iron chills, but if cast in sand, wet sand is to be preferred Alloy X, is a closer grained, more brittle, harder and stronger metal than alloy Y, and its whole structure follows more closely that of red brass. This alloy can also be cast in sand or in iron chills. It is also very easily worked and can be used for small or large castings. Both alloys flow well and permit of very thin walls. Excellent castings have been made, whose walls are .01-inch thick. Alloy X½ is still closer grained, more brittle, harder and stronger than alloy X, and is especially adaptable for work requiring great hardness and stiffness. Alloy .70. This metal is 2 cents per pound higher in price than any of the other alloys. It is used especially for work having very thin walls and where the metal calls for the highest quality of workmanship. Its particular application is in the manufacture of very fine mechanisms, such as optical instruments, etc. Alloys X and Y can be forged at very low heats. The typical forging alloys however, are alloys Z and O. Alloys Z and O are also used for rolling plates or for drawing wire or rods. O is a trifle softer and more easily worked than Z, and will stand the action of various chemicals better than Z. Z becomes hard when worked and is a little more brittle than O. O is used, however, for very thin wire and for high-class plates or for very thin sheets.

The metal is imported by Morris R. Machol, 16 Beaver Street, New York.

There once was a cranky machinist
Whose tactics were always the minist.
But as is always the way,
When it came to pay-day,
His envelope, too, was the linist.

RELATIVE COST OF PRODUCTIVE LABOR.

By George P. Pearce.

Recently there was brought to my attention a case where the expense rate or pro-rate of a certain plant increased from 7c per hour to 120 per cent of the total productive labor cost, while the firm increased from 300 to 3,000 men. At first sight this looks like an "awful example" of getting too much non-productive labor in a business organization. But is it? And does the pro-rate tell the whole story, as many managers seem to imagine?

While it is true that in many cases an increase in pro-rate points to an increase in the ultimate cost of output, yet the pro-rate alone is no indicator to judge from. A great rise in this percentage may be due to successful management, and many foremen and superintendents have got into "hot water" because their successful management had increased the pro-rate.

The manager who judges the economy of the whole organization from the viewpoint of pro-rate alone might as well attempt to judge the amount of orders received by the total weight of incoming mail. Suppose that a certain department has a burden of $100 per week for expenses, and suppose the pay roll is $400, then the pro-rate will be 25 per cent. of labor, now if they hire a blundering foreman who through mismanagement requires more men to get out the same amount of work and increases the pay roll to $500, this will decrease the pro-rate from 25 per cent. to 20 per cent. Should this foreman be highly commended for reducing the pro-rate? Then again, if it had been the other way and the foreman had been able to manage and keep up the output on a pay roll of $300 then should he be fired for increasing the pro-rate from 25 per cent. to 30 per cent?

A high proportion of non-productive labor may or may not mean bad management. Suppose in a large manufacturing plant a man is hired to look after the general power and through his care and ability over $5,000 per year is saved in coal bills alone, for a $1,500 salary, then surely no sane person would say that this increase in non-productive labor was a sign of bad management; the same with the chemist who saves the waste of crude material and keeps the product up to a minimum of cost, or the jig designer who reduces the pay roll for the same output.

Surely it is pretty conclusive that the pro-rate alone does not tell the whole story, and in expense analysis there is no such easy indicator of success. The only way is to view all points and then form judgment accordingly.

MACHINE SHOP METHODS AND DEVICES

Unique Ways of Doing Things in the Machine Shop. Readers' Opinions Concerning Shop Practice. Data for Machinists. Contributions paid for.

UNIVERSAL GRINDER ATTACHMENT.

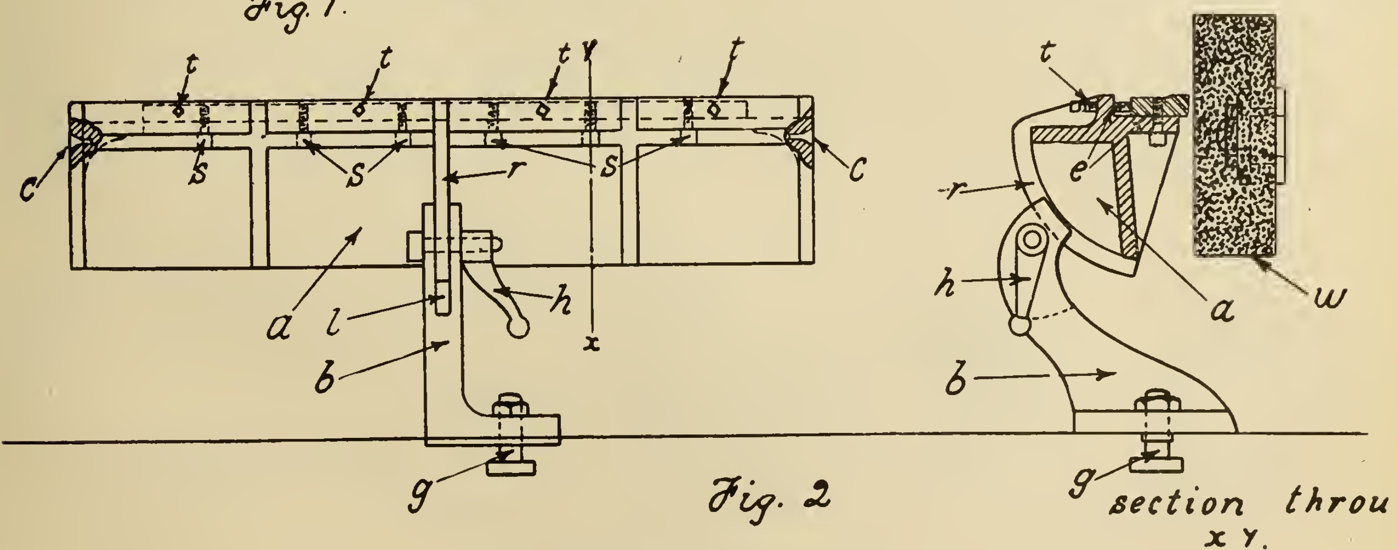
By William J. Hurley.

The enclosed sketch shows a jig made for the grinding of square shear knives on a Universal grinding machine. Fig. 1 shows a section of A. blade, which varys in length from about eight inches to four feet, and upwards. After the knives have been hardened they have to be straightened and ground on the edges i and j, the edge i for clearance, and the edge j for rake. It had been the custom to grind the edge j on a wide emery wheel by hand, but the jig shown does it much quicker and more even than formerly obtained.

Fig. 2 shows a front and end elevation in section of jig. (A) is the body of jig in the form of a long angle plate supported in the ends by the centres of the grinding machine as shown at cc. The knife is placed in position on the surface e, which must be planed parallel with the centre line of jig and adjusted in position by the set screws tt, and fastened to the jig by the clamp screws ss.

The bracket b is fastened to the bed of the grinder by the bolt g and kept in position by the tongue as shown. The slot t in the bracket is milled to fit the rib r on piece a. The piece a is revolved on the centres until the desired rake is obtained on the knife and the jig is locked in position by a movement of the handle h.

Fig. 1.

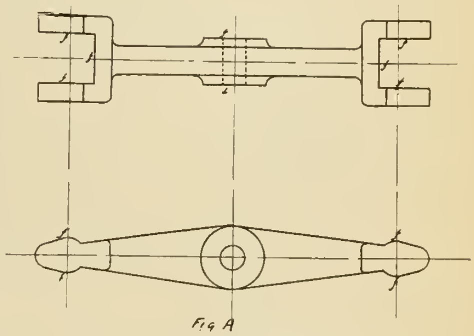


Grinding Square Shear Knives.

MILLING JIG.

By R.G.D.

When in a strange shop I have always made it a point to see and learn every. thing I can and if possible help the other fellow. In going through the shop of a well known manufacturer I was very much surprised to see one of the apprentices milling one of the pieces, Fig. A, in a common milling machine vise, and by observing the shape it will be seen that he was.having all kinds of trouble keeping the vise at 90 degrees while milling the ends, as he only had one forming cutter and was only able to do one end at a time. The writer said to the foreman that it seemed entirely feasible to use a jig on the work and save about two-thirds of the time, and also have a much better job when finished, and was asked if he could help out, and while standing in the shop the writer sketched the jig shown, which will be readily understood by reference to the drawings.

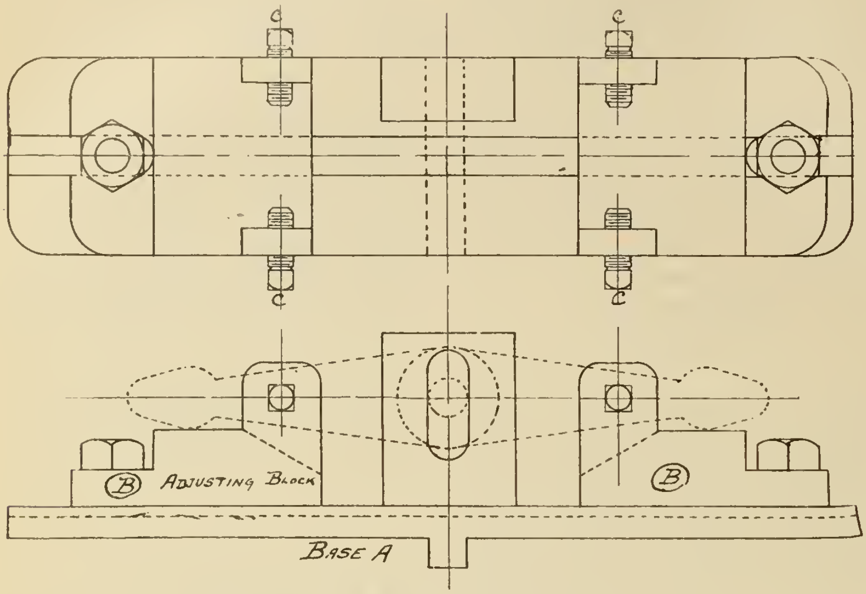


Pieces Being Milled.

The base A is milled on top and bottom and groove cut in top to allow the adjusting of the blocks B, B, for the different.lengths of levers to be milled, the tongue in the bottom was milled to fit the T-slot in the milling machine table as it is at exact right angles to the centre line of work. The projection from the base with the oblong hole is finished to allow of bolting the levers to it as they come from the lathe, bored and faced on the centre boss. Being a rough casting, they required means of adjusting in the jig which is provided by the four set screws C and the centre bolt which is squared for ½" from head to allow up and down movement but prevents turning and keeps the levers the exact distance from centre to bearing point once the machine is set.

As the levers are reversed so as to mill both ends with one cutter, they are exactly central, which was, the writer was informed, the essential point. Of course, by using two cutters the time would be cut in half, but one cutter was all the firm possessed.

This is not offered as a perfect jig, but simply as a sample which might help to a solution of some difficulty which is at present bothering him.



Jig Made for Milling Pieces Shown in A.

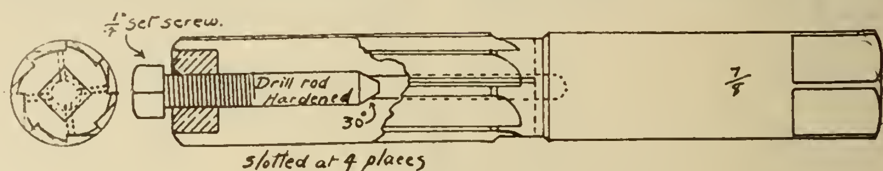
ADJUSTABLE REAMERS.

By "Nene."

These reamers, shown Fig. 1 and Fig. 2, may be adjusted in a moment by simply turning adjusting screw S, and if adjusted too large they may be reduced again in the same manner. Herein lies their advantage.

Fig. 2 shows a hand reamer ⅞" diameter, but these reamers are made in various sizes ranging from ⅜" to 1" diameter, and are well adapted to ream any hole where the reamer can pass through the hole more than half the length of the reamer, as after expanding the reamer, the largest diameter is about half way up the reamer. The shanks of the hand reamers are ground same size as standard plug gauge, and in some cases serve the purpose of gauging the reamed hole.

These reamers do not get as far from parallel as would appear at first glance. They are made exact size at the beginning and when they need adjusting it is because it has worn off somewhere, and in adjusting it you simply take up this wear, and as the reamer is honed only at the dull places it will retain its form fairly well after repeated adjustments.



Hand Adjusting Reamer.

In tempering these reamers they are first filled with clay, heated to a cherry red, then plunged in brine for a time, just long enough to chill the cutting edges of reamer, as near as may be judged, they are then plunged in oil (fish oil in this case) and kept moving until almost cold. Afterwards, if convenient, they may be placed in hot soda water, or washed in benzine to remove the superfluous oil before cleaning for drawing temper.

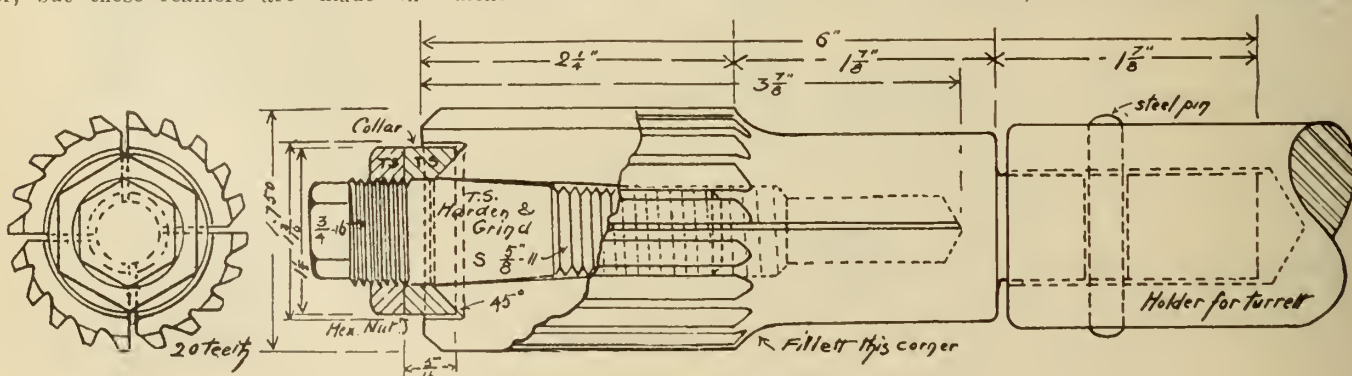
They are then drawn to a light brown color, after which the point of reamer is dipped in hot lead and drawn to a blue for about half an inch in length, as the reamers showed a tendency to break at this point when being expanded.

This softening at the point does not interfere with the working of the reamer, as they are always reduced at the point for about this distance.

A reamer tempered as above will stand considerable abuse. In an emergency a ¾" reamer has been expanded about .020" without material injury to the reamer, and done fairly good work even under this disadvantage.

Formerly the adjusting screw and plug Fig. 2 was made in one piece, but this was abandoned as a useless luxury, for in case the plug does not follow the screw in reducing size of reamer, the plug may be forced back by inserting any thin piece of metal in the slot of reamer.

Fig. 1 shows a machine adjustable floating reamer, for use in turret lathe. It is adjusted by first loosening nut, then turn screw S, after which nut is again tightened against collar, thus binding points against adjusting screw. The taper on screw S is somewhat greater than the taper in the hole, thus insuring a good bearing where it is needed most, at the extreme end of reamer.



Floating Adjustable Reamer.

W. Fry Scott, consulting structural engineer, Aberdeen Chambers, Toronto, has been engaged by the Mutual Fire Insurance Companies to give manufacturers skilled expert advice on matters of construction and protection.

HARDENING VARIOUS NOVO TOOLS.

By Wm. Abbott *

Twist drills should be heated to a good high lemon color, almost a white welding heat, or 2100 degrees, and should be hardened in either thin fish, cotton seed or linseed oil. Only the flute of the drills should be submerged in oil and the shank should be allowed to cool off by itself. Care must be taken in hardening these drills that the hardening line is not too precise. The shanks must be kept as soft as possible, that is, not hardened. This prevents them from breaking, but at the same time, the shanks must be left stiff enough to prevent them from twisting and bending, and the heat running up from the fluted part of the drill which is white hot in the hardening, brings the heat of the shank almost to a high lemon color heat, thereby sufficiently stiffening the shank by cooling off in the air to prevent the shank from being too soft. The temper should then be drawn in oil to 500 degrees on all sides, although on certain larger sizes it may not be necessary to draw the temper as low as 500 degrees. Also on certain smaller sizes, smaller than $\frac{1}{2}$'', the temper need not be drawn as low as 500 degrees. This will depend altogether on the class of work on which the drills are to be used.

Reamers should be hardened in practically the same manner as the drills, only that the temper on 3 fluted and 4 fluted chucking reamers is only drawn to 450 degrees, and on regular machinists' hand reamers, and bridge builders' reamers, the temper is not drawn at all. This will also largely depend on the class of work on which the reamers are to be used. The shank of the reamer should be left as soft as possible by allowing the shank to cool off in the open air, and it may also be found well to apply putty to the shank of some of the reamers in order to keep the shanks perfectly soft.

End mills should be hardened in exactly the same manner as drills and reamers, and the temper should be drawn to about 450 degrees and the shank can also be left soft in the method above described.

Threading dies should be heated to about 2000 degrees and hardened in oil, fish oil preferable, and the temper drawn to about 525 degrees or almost a blue.

Chasers should be hardened in the same manner as threading dies.

Blanking dies and punches for punching stock about .030 thick are hardened in the gas furnace in a crucible, making sure that the tools are thoroughly heated through and through at a good high lemon color, almost a white heat. Dies are drawn to about 450 degrees and punches to about 525 degrees. For work heavier than this the dies are drawn to about 525 degrees and the punches to 630 degrees. Novo steel can be drawn to these degrees without impairing its efficiency, in fact, the dies have been drawn to 630 degrees, taking practically all the color out of them. This, however, was for exceedingly heavy work, and for an open die where there was considerable strain.

Milling cutters should be heated to a high white heat, 2200 degrees, and on all cutters smaller than 6'' diameter by 1'' thick the temper need not be drawn. On cutters larger than 6'' diameter and 1'' thick, or cutters larger than 3'' diameter by 2'' thick it would be well to draw the temper to a light straw color or 475 degrees, or the hardening strain should be at least taken out of the tools by running a hot iron bar through the centre.

Boiler punches should be heated to a lemon color heat, 1900 degrees, hardened in oil, and the temper drawn to about 600 degrees, or an absolute deep blue.

Shell reamers should be heated up to 2100 degrees hardened in thin oil. The hardening strain of the reamer should then be relieved by running a hot iron bar through the reamer, and also place the back end of the reamer on a hot piece of iron, allowing the color to run up $\frac{1}{2}$'' from the back end of the shell reamer to a good blue, which will also prevent the reamer from breaking.

* Canadian Agent, Montreal.

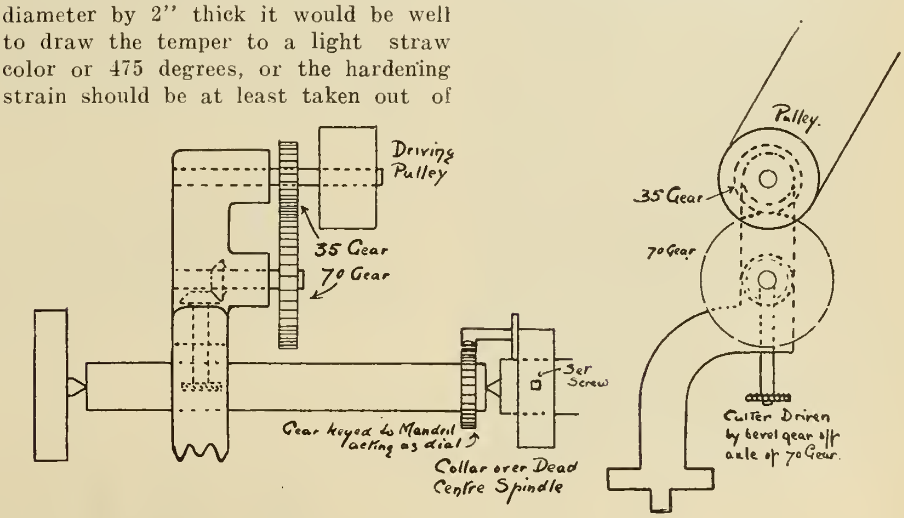
MILLING ATTACHMENT FOR LATHE.

By Arthur Baldwin.

The company by whom I am employed have not a milling machine in this particular plant and we were continually having breakdowns in lathe gears and other gears, causing delay and inconvenience.

I made the following lathe attachment which has given excellent results and does the work accurately. It would be quite easy to improve it and I think it would be a good tool to use in such shops that do not have a miller. A casting is made to fit the lathe tool post carrier, which is drilled true, any size to meet with the views of the man who is building. I drilled this particular lathe $1\frac{3}{8}$ in.

In Fig. 1, A is main casting, B is base of casting which fits into tool post carrier, C is bore through bracket of casting, through which a shaft runs, carrying on top a small bevel gear, D is the gear-cutter or miller. On the bottom of this is the particular cutter necessary to cut the gear. At right-angles to this shaft and gear is another shaft and bevel gear, which engages the angle gear on the vertical shaft. On the end of the



Milling Attachment for Lathe.

horizontal shaft is keyed an ordinary screw-cutting gear. In my case I used 70 teeth. Above that the casting is bored again for the second horizontal shaft, which has attached to it another gear. In my case I used 35-teeth gear and on the end of the shaft a small pulley to drive the attachment. I made this attachment to suit a small engine lathe. The dimensions will have to correspond to the size of the lathe on which one wishes to use this attachment.

To drive the attachment, I cut away half of countershaft bearing and attached a coupling to the end of countershaft with hangers on the other end, making the shaft about half the length of the lathe. Drive with a small pulley on the extended countershaft to small pulley on milling attachment.

The gear blank to be cut is placed on the mandrel between the lathe centres. The attachment is held in tool post holders by two short, square-headed bolts. The ordinary lathe drive is used. To feed the lathe carriage carrying the milling attachment and the milling cutter over the gear for cutting the blank, I ran the line centre in the end of the mandrel. That carried the ordinary

lathe feed as coarse as desired. To keep the blank and mandrel from revolving in lathe centres I keyed a gear onto the end of mandrel, the multiple of the one to be cut. Suppose a gear of 25 teeth is to be cut, I might then key to the end of the mandrel 75 teeth gear to act as dial. On dead centre of lathe I made a collar to which I attached an upright piece with a slot in it. To it I attached a horizontal piece filled at point to fit exactly the gear acting as dial. If I desire to cut a gear of 25 teeth, I cut one tooth and revolve the blank and likewise the mandrel to which is keyed the 75-gear, three teeth. By moving three teeth each time I spaced off accurately the 25 teeth on the gear I made.

Summing up the Description.

A belt is run from an extended countershaft to drive a pulley on milling attachment, which rests in the tool post slot. This pulley drives shaft, which has on the end an ordinary lathe gear of say 35 teeth.

Parallel to that shaft is another, spaced off the necessary distance to engage another lathe-gear of 70, which is keyed to shaft on end of which is a bevel gear driving another bevel gear on the end of the vertical shaft. At bottom of vertical shaft is attached the necessary milling or gear cutter to cut the gear desired. The cutter is held on the vertical shaft by a key and two jam nuts. It is fed over the gear to be cut by the ordinary lathe feed. The line centre revolving on end of mandrel carries the blank to be cut, or a dozen if necessary. The mandrel is kept from revolving by a gear keyed to end of it, which is engaged to a piece running from a post attached to an upright fastened to the dead centre. This gear acts as dial also.

I did not find it necessary to stop milling attachment every time I cut a tooth or part of tooth. After going over gear, I brought back the carriage, backed out dead centre, revolved mandrel three teeth, fed in dead centre and went over gear again. Of course, almost any size of gear can be cut. The cost is small and I found it true and accurate.

A LATHE JOB.

Fig. 1 shows a sketch of a brass spiral cast upon a cold rolled shaft. Between the ribs a strip of rubber had to be inserted the full length of the spiral. Being a rough casting, the pitch of the spiral varied a little but by measurement the average pitch was about 9⅞ in. in 6 revolutions or 1.6458 in. pitch.

Figs. 2 and 3 show views of the jig made to stretch and press the rubber in the groove on the spiral, the rubber strip being nearly ⅛-in. wider than the groove.

The frame F was bolted to the tool post rest on the saddle, the top of the lower roller R being on a level with the top of the spiral rib r in Fig. 1, when it is between the centres of the lathe.

The rollers R are adjusted by the screws S passing through plate P until the rubber which passes through the rollers is stretched sufficiently so as to allow the roller L to press the rubber between the ribs on the spiral.

The lathe had to be geared so that the saddle would travel 9⅞ in. while the spindle made 6 turns.

The lathe had a 4-thread lead screw and had 3 changes of feed for each train of change gears that is standard, half and double. If you set the lathe up to cut a screw of 8 threads per in., by moving a lever one way or another, you could cut either 4 or 16 threads per inch.

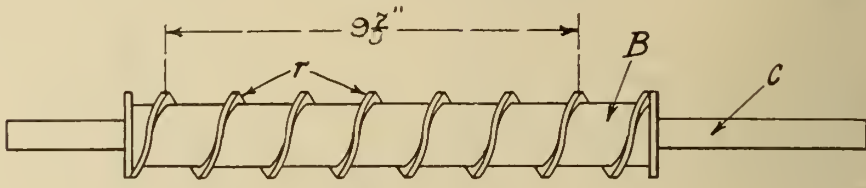


Fig. 1.

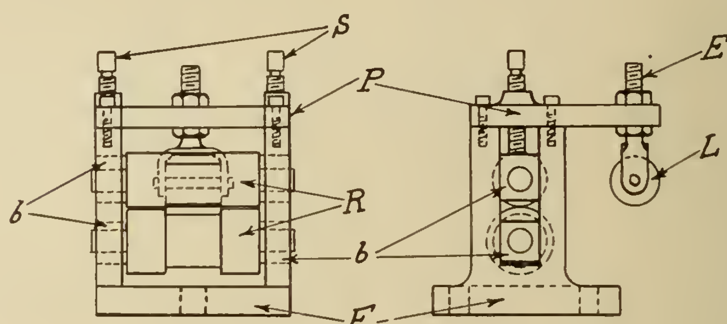


Fig. 2. *Fig. 3.*

The change gears on the lathe were:
40
20 30 35 40 45 50 55 60 65 69 70 80

Now the question is to find a train of gears that will cut the required pitch.

After considerable figuring we found that the nearest we could get to it without fitting up an extra stud was to make an extra gear having 75 teeth (there being no gear of that size on the lathe.)

By calculating the same as if the lead screw was 5-in. pitch instead of .25-in. pitch (the change of feed from standard to double making this allowable) we have: Pitch of lead screw × driving wheels = pitch of work × driven wheels, or pitch of work =

$$\frac{\text{pitch of lead screw} \times \text{drivers}}{\text{driven wheels}} =$$

$$\frac{5\times\overset{23}{\cancel{69}}\times\overset{15}{\cancel{75}}}{\underset{7}{\cancel{35}}\times\underset{3}{\cancel{45}}} = \frac{11.5}{7} = 1.6428.$$

cut by train of gears

driven → 35, 45; 69, 75 ← drivers

Pitch of spiral =1.6458 in.
Pitch cut by train of gears =1.6428 in.

Error .0030

But as this was only an error of $\frac{21}{1000}$ in 7 revolutions it was of little importance on this particular job.

A HANDY SUPPLY OF STUDS.

A supply of ⅞-in. square nuts the width of the T-slots in the boring mill and studs in lots of four each of lengths varying by 2 in., do away with hunting for bolts. This applies to both planer and boring mill.

The studs should be in sizes 4, 6, 8, 10 and 12 in. If a 10-in. is spoilt, cut off the thread and rethread it for an 8-in., thus saving it.

Tell a man that he is doing well and he will do better.

Always encourage the inventive faculty in an employe; encourage him to think—even the small boy may give an employer an idea that will bring thousands of dollars.

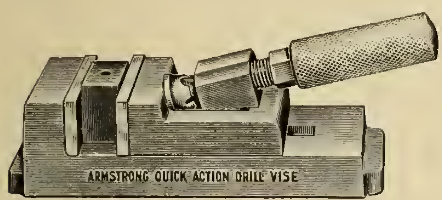
The man who can "do things," and do them right, without being continually instructed, is the man who is most appreciated in business, and the one who is sure to succeed.

DEVELOPMENTS IN MACHINERY

New Machinery for Machine Shop, Foundry, Pattern Shop, Planing Mill; New Engines, Boilers, Electrical Machinery, Transmission Devices.

ARMSTRONG QUICK-ACTION DRILL VISE.

This tool is especially designed for rapid working of the jaws without using the slow screw movement generally in use. Among the improvements claimed for this vise is the action of the sliding jaw. This draws down and against the work, when tightened, instead of having the tendency to lift as in the case of vise jaws operated in the ordinary way



Armstrong Quick Action Drill Vise.

by a screw in the base. The sliding jaw is held in place by a hinged clamp, which extends down through a slot in the base. The rear of the jaw is inclined and the tightening screw has a ball-jointed abutment on its end which bears against this inclined surface. When the handle is pressed down it binds the clamp securely in position against the base, by means of an eccentric surface formed by the upper part of the clamp. One turn of the handle tightens or releases the vise.

The sides of the tool are ground at right-angles to the base, which allows the work to be got at from three sides. This vise, which is provided with projecting lugs for strapping it to the machine, is also adaptable to use on the shaper or milling machine. It is made in three sizes, No. 1, opening $1\frac{3}{4}$ in. by 2 in. wide, by 15-16-in. deep: No. 2, $2\frac{1}{2}$ in. by $2\frac{3}{4}$ in. by 1 3-16 in.; No. 3, 3 in. by $3\frac{1}{2}$ in. by 1 7-16 in.; the weights being $4\frac{1}{2}$, $8\frac{1}{2}$ and 16 pounds, respectively. They are manufactured by Armstrong Bros. Tool Company, 113 N. Francisco Avenue, Chicago.

30'' VERTICAL TURRET MACHINE.

On this machine the vertical adjustment of the cross rail, $17\frac{1}{2}$'', enables the operator to get rigid support for turret. The rail is raised and lowered by hand wheel, the raising screw being provided with ball bearing thrust.

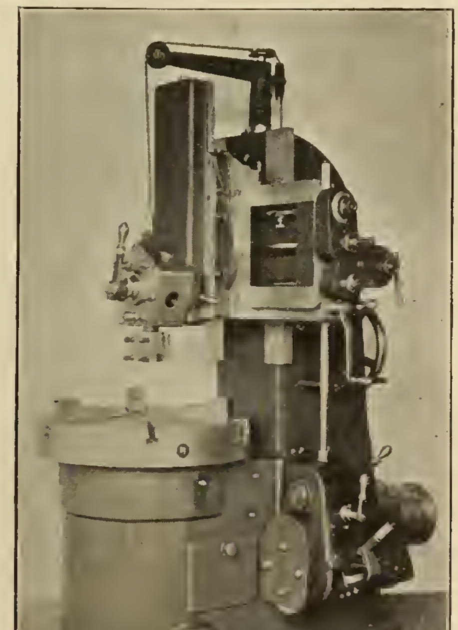
The cross slide has a total travel of 23''. Fixed automatic stops are placed at both ends of slide which automatically trip feed when adjustable stops are not set.

The turret slide has a vertical travel of 17'', and is mounted on a swivel saddle attached to cross slide by a central stud. This slide is operated by a quadruple thread screw and nut connected with raising shaft by bevel gears. The feed of turret is controlled by an adjustment on end of cross rail which provides an automatic trip and also acts as a vertical stop gauge used in connection with graduated disc. The turret slide is counterbalanced.

The turret is a 10'' diameter pentagon, and tools are clamped in place by hardened steel set screws and bushing nuts. The lock bolt is of hardened steel working in a hardened steel index.

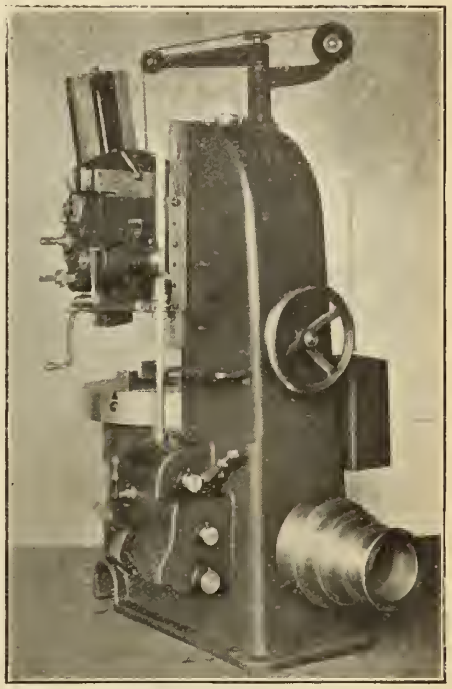
The chuck spindle has large angular thrust bearing, slide strains being taken by vertical taper bushing which is scraped to a bearing the full length.

Change gear feed mechanism is arranged in box at side of machine. There are twelve changes in all as follows:—7, 8, 9, 10, $11\frac{1}{2}$ and 12, which will triple by positive clutch to 21, 24, 27, 30, $34\frac{1}{2}$ and 36, for both horizontal and vertical



Vertical Turret Machine—Front View.

feeds. All feeds are reversible, and provision is also made to vary above feeds by use of change gears on side of gear box.



Vertical Turret Machine—Back View.

Table is 30'' in diameter and is driven by spur gearing. Sixteen changes of table speed are provided. Steel and phosphor bonze gears are used.

Principal dimensions are as follows:—Capacity, 32'' diameter; maximum distance under cross rail, 26''; minimum distance under cross rail, $8\frac{1}{2}$''; maximum distance under turret head, $28\frac{1}{2}$''; vertical travel of turret slide, 17''; vertical adjustment of cross rail, $17\frac{1}{2}$''; maximum horizontal travel of cross slide, 23''; floor space, 68''x47''; height over all, 88''; weight (approximate) 5,300 pounds.

This machine is manufactured by E. J. Flather Mfg. Co., Nashua, N.H.

UNIVERSAL BORING, MILLING AND DRILLING MACHINE.

It is of the class that has the head at the right end of the bed, the idea being that boring and milling are more conveniently accomplished by this arrangement. It is known as the No. 1 machine, and takes 54'' (and with the extension of bed, 94'') between the face of the spindle and the outboard bearing support. Its floor dimensions are 8x14 ft. and it weighs 7,800 lbs.

The bed of the machine is of box pattern, and upon it the carriage with its table has horizontal movement. The table is 20x42", but larger work may be held by using the auxiliary table. The head is arranged to move vertically in unison with the outboard bearing which supports the outer end of the bor-

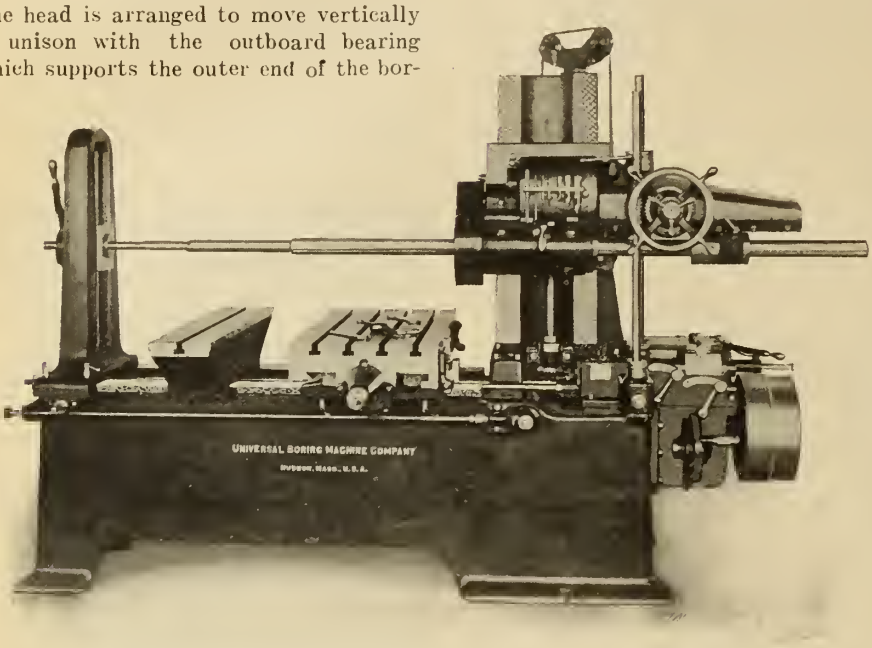


Fig. 1—Universal Boring, Milling and Drilling Machine.

ing bar. The total vertical travel of the head is $22\frac{3}{4}$". The spindle has an all geared drive from a constant speed shaft, with 16 changes of speed in the speed box and head, running from 15 to 200 revolutions per minute. There are feeds in all directions, comprising longitudinal carriage, cross table feed, vertical feed of the head and longitudinal feed of the boring bar. The feeds are independent of the spindle speed and range from $\frac{3}{4}$" to $5\frac{1}{2}$" per minute. By operating the boring bar feed and the carriage at the same time, and in opposite directions, it is possible to get a maximum feed of the tool into the work of $16\frac{1}{2}$" per minute. The feed box gives nine feeds. The control of the machine is all shown in Fig. 2 as designated by reference letters.

Q is the belt shifter, by means of which the machine as a whole is started and stopped; A and B the levers controlling the changes of speed, which changes are doubled by the fast and slow speed lever F, at the head; H and H are the levers that regulate the feed; D the lever controlling the power raising and lowering of the head; C the table and bar feed lever; E the lever through which all feeds are reversed; J the hand wheel for quick hand feed of the boring bar; K the crank hold for fine hand feed of the boring bar and hand elevating of the head.

The speed box is shown open in Fig. 3. It occupies the lower part of the box at the head of the machine, the upper part being used for the change feed mechanism. By the use of nine gears and segment gear N, in Fig. 4, having two studs, one above and one below the pivoting point, and a rocker gear, operated by a hand lever, eight speeds are obtained. The cone of four gears as shown in Fig. 3 by L, keyed together, slide on the constant speed shaft. A gear O running loose on the upper stud of the segment gear meshes with the smaller of the two gears that are keyed on the shaft that runs through the centre of the segment N. Two gears keyed together, designated by P, are mounted on the lower stud of the segment N, one of these meshing with the larger gear on the shaft through the segment. Rocking the segment N in one direction to engage one of the four cone gears L, gives one speed; rocking it in the other gives another speed. Two speeds are similarly obtained for each of the other gears of the cone L, making eight speeds which are doubled at the head, making sixteen speeds, ranging from 15 to 200 revolutions per minute, with the constant speed shaft running at 230 revolutions per minute.

The segment gear N is locked at various positions by the pin O, which is operated by lever B in Fig. 3. Cone gears L slide by means of shaft M and are locked in their proper positions by means of lever A, Figs. 2 and 3.

An important convenience lies in the manner in which the feed and speed boxes are fastened together. To detach them from the machine it is necessary only to remove six screws and pull out the speed and feed shafts.

The directions of the feeds always bear the same relation to one another. All are reversed with the same lever, and to reverse means that the head feeds up, the table feeds away from the operator and the boring bar feeds toward the outer bearing support. In addition to these feeds the head has also one fast up-and-down travel, which permits the boring bar to be brought to a point quickly without the use of the hand crank. The head has a hand adjustment with a graduated dial. On one of the bearing surfaces upon which the head moves is a scale graduated in inches, the zero indicating the point where the centre of the spindle is in line with the top of the table. Using the quick power feed in conjunction with this scale it is possible to stop the

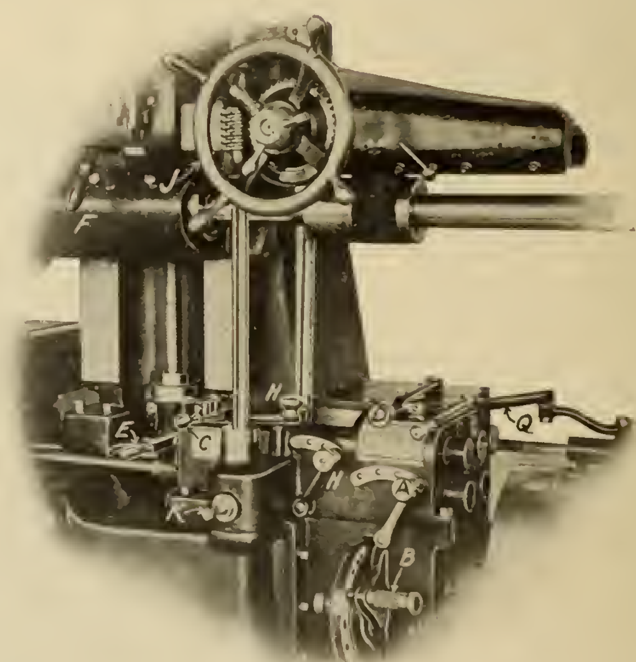


Fig. 2—Showing Controlling Handles in Convenient Location.

movement of the head within 1/8'' of the point required, and the adjustment is completed by using the hand feed and graduated dial. The table, carriage and head are each provided with graduated dials reading to thousandths of an inch.

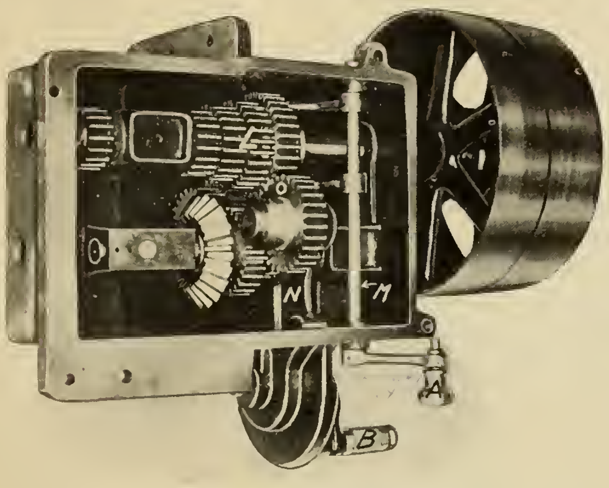


Fig. 3—Change Gear Box, Giving Eight Speeds.

The power feed for the carriage is an interesting detail of the machine. Beneath the carriage are three gears supported by a bracket. One gear is on the table feed shaft, another on the carriage feed screw, while the third is a pull gear on a stud between them. The removal of this gear provides the means of quickly disconnecting the power feed from the carriage. Any feed of the boring bar may be doubled by the use of this mechanism, which is designed especially for use in drilling. A pin is screwed in the bed below the bracket to take the pull gear when it is not in use. The boring bar is able to feed 25'' and can be reset by a clamped bearing so that 55'' of travel can be obtained. The hand wheel is set at a point most convenient for the operating and setting of the boring bar, permitting the operator to be close to his work and within easy reach of the feed friction or hand wheel. The alignment for the outboard bearing for the boring bar with the head is maintained by a connection between the elevating screws of each through spiral gears and a shaft within the head.

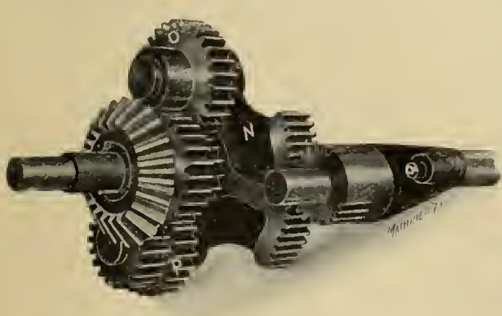


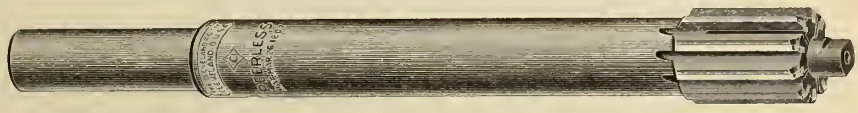
Fig. 4—Tumbler Gears in Detail.

The table has a feed of 30'' with automatic stops. The vertical power travel of the head is 22¾'' with the possibility of 24¾'' when fed by hand.

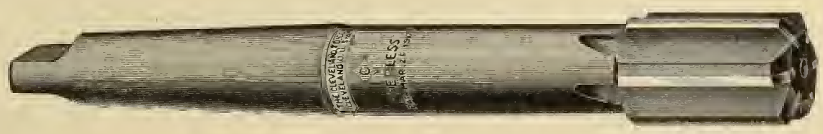
This machine has just been brought out by the Universal Boring Machine Co., Hudson, Mass.

"PEERLESS" HIGH SPEED REAMERS.

Blades of high speed steel are fitted into and solidly joined to a special soft steel body by a process called "Brazo-Hardening," developed and patented by the Cleveland Twist Drill Co. This process is said to unite the high speed steel of the blades with the soft steel of the body into one solid, inseparable whole. The high speed blades only are hardened, so that while "Peerless" reamers have all the hardness and cutting qualities of solid high speed tools they are at the same time not brittle.



Peerless Long Set Expansion Turret Reamer.



Peerless Taper Shank Core Reamer for Reaming Cored Holes.

The "Peerless" high speed expansion reamers made with soft bodies are interesting. The expansion takes place at the cutting end of the reamers, and answers a double purpose:—(1) to keep them up to size at the point where most subject to wear; (2) they are to vary the amount of longitudinal clearance according to the material to be cut and prevent jamming in the hole. Shell reamers as well as hand and chucking reamers are made in the expansion style. These "Peerless" expansion reamers will stand great expansion and have as many cutting edges as a solid reamer. Their price is about the same as that of ordinary solid high speed reamers.

Peerless Short Set Turret Reamer.

They are manufactured by the Cleveland Twist Drill Co., Cleveland, Ohio.

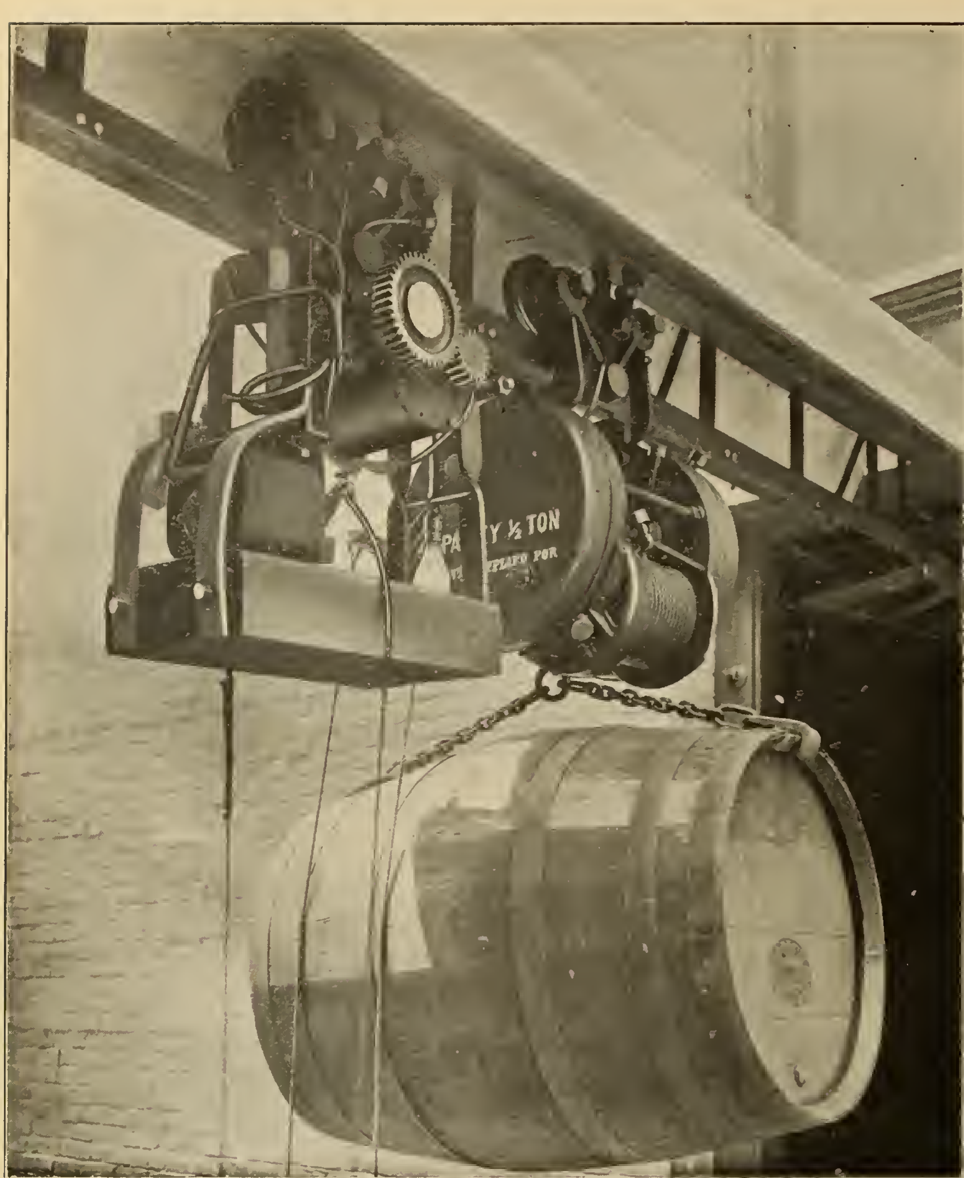
HORIZONTAL BORING, MILLING AND DRILLING MACHINE.

In the design of this machine are several features of interest; such as encased gearing and moving parts; convenience of operation; all steel gearing; adjustment for wear of spindle and absolute alignment of spindle with outer support bearing.

It has 23'' spindle travel; 21'' vertical head travel; 36'' lateral table travel; and 28'' cross travel to table. The distance from face of spindle to boring bar support is 60''. Outer support can be taken down for overhanging work. Spindle travel and table cross travel are by power in either direction and all are equipped with micrometer adjustments.

Working surface is 50½'' long by 23½'' wide. It has 28'' cross travel and 36'' lateral travel on the bed. There is 3'' diameter in driving sleeve and 1½'' diameter in rear sleeve. End thrust taken on ball bearings. No. 5 Morse taper with cotter key. Driving sleeve is equipped with device whereby the spindle can be held true after any amount of wear, and also has flange for fastening large special cutters.

It has a positive drive throughout. Two mechanical changes are made with positive clutches. Spindle speeds are 8 in number and range from 12½ to 155 r.p.m. There are eight changes of feed, from .007'' to ¼'' per revolution of



W. D. Belath Electric Hoist and Trolley

spindle. All are reversible. The net weight of machine is 7,700 lbs.

This horizontal boring, milling and drilling machine is manufactured by the Fosdick Machine Tool Co., Cincinnati, Ohio.

ELECTRIC HOIST AND TROLLEY.

The electric hoist and trolley shown in the illustration is a combination of two units working as one. They can be worked together as shown or individually as may be required. The photograph showing the hoist in operation was taken in the Cosgrave Brewery, Toronto. It uses only a single rail track and can switch and turn on a radius of four feet. The trolley works on the principle of street cars, the rail containing the return current.

These two units may be uncoupled and the hoist used as a hoist only, as is often necessary over a lathe. The trolley can be attached to anything else to move it along.

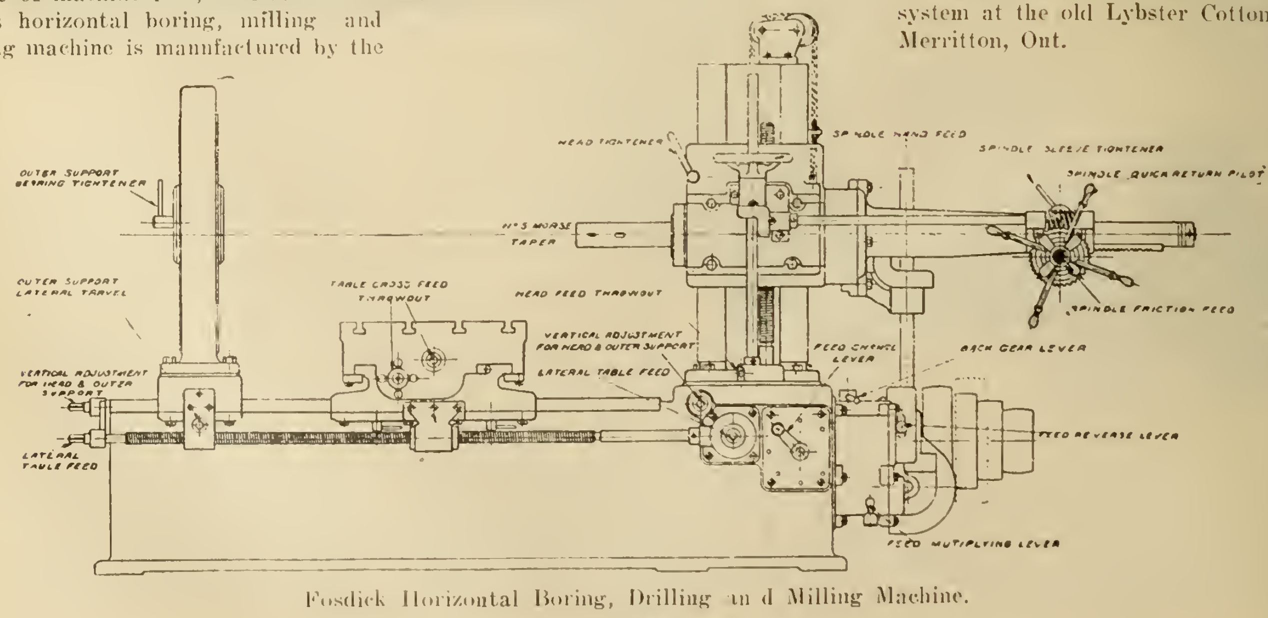
Underneath the trolley is fastened an iron weight but it may be replaced by a cab in which a man can ride. The features of the combination are the compactness and head-room obtainable.

The trolley is arranged on swivels so that there is a bearing on the track at all times, the wheels following any unevenness that may be in the track. The Cosgrave Brewery is the first instalation but a full line of these combined sets will be built. They are patented and manufactured by W. D. Beath & Son, 193 Teranley St., Toronto, Ont.

PERSONALS.

H. H. Charles, formerly resident engineer on track for C.P.R. on their Sudbury line, has now charge of work on the Transcontinental Railway at Portage Road, N.B.

A. S. Cook, C.E., who for several years has been connected with the Cataract Power Co.'s interests and other work in the Niagara Peninsula, has been engaged by the Lincoln Paper Mills Co. to instal their new hydraulic power system at the old Lybster Cotton Mills Merritton, Ont.



Fosdick Horizontal Boring, Drilling an d Milling Machine.

POWER GENERATION AND APPLICATION

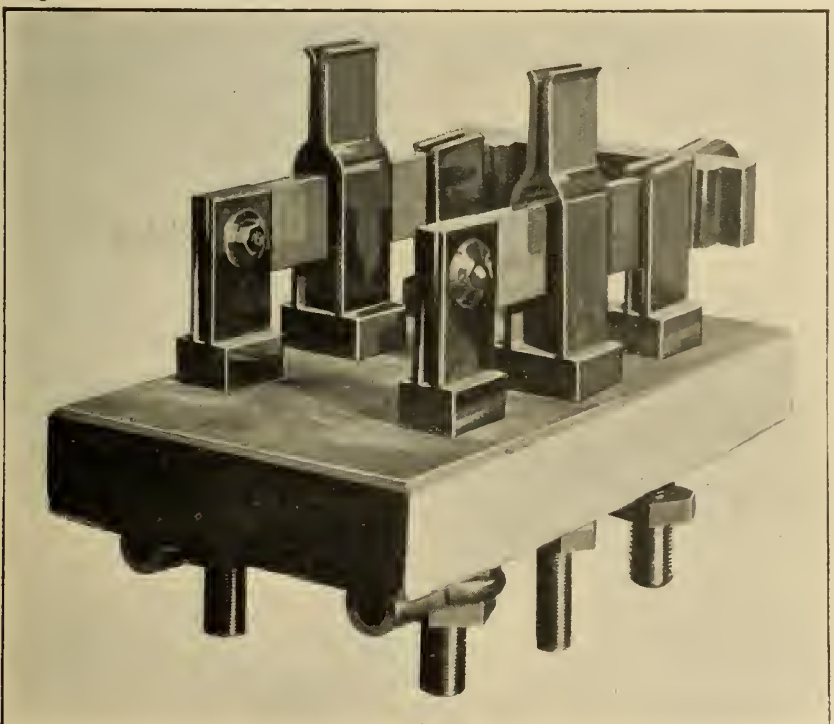
For Manufacturers. Cost and Efficiency Articles Rather Than Technical.
Steam Power Plants ; Hydro Electric Development ; Producer Gas, Etc.

CONTACT SWITCH.

Illustrated herewith is a new switch which is just being prepared for the market, containing some distinctive features. These are the supplementary or discharge clips. The cut shows the switch in the closed position when the blades are free of discharge clips. Contact with these latter, however, is made on opening and circuit is broken from these supplementary points.

On opening the switch the field of a machine is shunted by means of these clips through a resistance which gradually absorbs the current and thereby prevents injury to field by relieving it of the inductive kick resulting from the sudden opening of the circuit. For motor work in connection with resistance or auto-transformer this switch provides a very effective and a cheaper starting device than regular controller or auto-starter. It also allows two sets of fuses to be used and does not require the operator to go through the unnatural action of completely closing, opening, throwing over to extreme opposite position and again closing in order to change from starting to running position.

This switch is being built up to 300 amp. capacity by the Hill Mfg. Co., 1560 St. Lawrence Boulevard, Montreal.



New Hill Contact Switch.

PORTABLE TACHOMETERS.

These are based on the action of centrifugal force on weight pivoted on a rotating spindle. The movement of these weights, when rotating, is controlled by gravity, or by springs, and is indicated by a pointer mechanically connected to them. The pointer, therefore, at any moment indicates the exact position of the rotating weights.

The pointer gear is provided with a damping action which ensures a steady movement of the pointer. The spindle bearings are fitted with oil rings.

The readings are independent of the duration of the test. They can be read on the dial of the instrument and indicate the smallest speed variation occurring during a fraction of a minute and are independent of the direction in which they are driven.

They are mounted on alloy cases, highly polished and lacquered. Each instrument is supplied with triangular steel points, rubber points and funnel centres, extension bar for the spindle and disc pulley.

The disc pulley is used for determining belt, rope and periphery speed. A

Portable Tachometer.

v-shape groove is turned in the edge of the disc pulley or measuring wheel, and where shafts are not easily accessible, the measuring wheel can be driven by a thread which is passed round the shaft and runs in the groove of the measuring wheel.

NEW FRICTION CLUTCH AND CUT-OFF COUPLING.

In Fig. 1 is shown a half-tone of a new solid and split friction clutch and cut-off coupling, just placed on the market. Fig. 2 shows the clutch with the sleeve which is also used as a pulley. It also shows the clutch out of gear. Fig. 3 is the clutch in gear with a coupling hub attached. This is attached where the clutch is used as a cut-off coupling.

To put the clutch in gear, the sliding collar B, Fig. 2, is pushed in towards the driving hub C by a shifting lever attached to the thrust collar A. The shifting lever is not shown in this illustration. As this operation takes place it acts on levers K and J by pushing them in towards the driving hub C. This operates a toggle motion at the end of the lever J which draws up the slack on the draw-bolts I against the spring M, thereby

compressing parts F, D, E, D and C, together. The parts E and F, are feather-keyed to the driving hub C and the parts D and D are feather-keyed to the sleeve G or coupling hub O. This transmits the power from the driving hub C, which is keyed to the shaft; to the pulley on sleeve G.

If a cut-off coupling is used, the power is transmitted to the coupling hub O, which is keyed onto the other shaft as shown in Fig. 3.

The clutch has great power for size of clutch, due to large friction surface. The clutch is small in diameter and very compact for the power produced. This is important, especially where there is limited space.

The clutch cannot start when out of gear. When the clutch is out of gear and the power is out of gear, the belt running over the pulley which is keyed to the sleeve G, has a tendency to pull the belt one way or the other, but as the wood discs are only feather-keyed to the sleeve, they can move easily.

The sleeve may be fastened from giv-

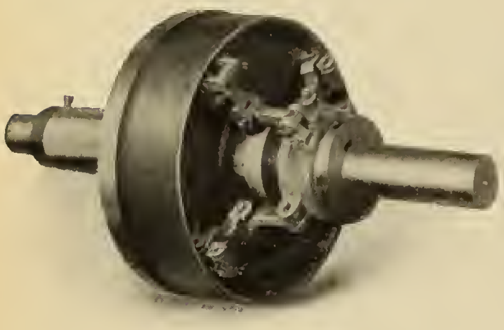


Fig. 1.—New Friction Clutch.

ing one way by butting up against the driving hub C and prevented from going the other way by collar H, as shown in Fig. 2. This construction prevents any danger of the parts being thrown together by the motion of the belt on the pulley, and starting the clutch unexpectedly.

The clutch is easily adjusted. Each lever mechanism can be adjusted separately. To do this the nuts on the end of the draw bolts I are tightened or loosened as required with the ordinary wrench. The levers K J and L are all connected together by steel pins, with cotter split pins through the ends of the steel pins. This prevents any of the mechanism from working loose.

Levers and draw bolts are all made of steel. The levers of clutches are subject to severe stresses, and in having all steel levers, it reduces to a minimum any danger of breakage.

This clutch is so constructed that above the two smallest sizes it can be supplied either solid or split.

It is provided with a solid iron sleeve, and split babbitted sleeve interchangeable and removable without disturbing the mechanism. The solid iron sleeve is generally used with the solid clutch, and the split babbitted sleeve with the split

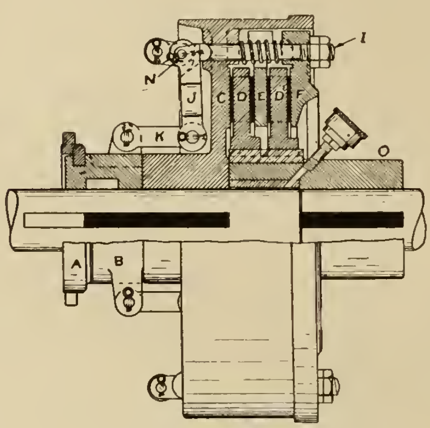


Fig. 3.—Friction Clutch.

clutch. However, they are made interchangeable, as sometimes a split sleeve may be used to advantage with a solid clutch. The reason of this is that sleeves as a rule get out of order a great deal quicker than the rest of the clutch and often require to be removed from the shaft to be repaired. In putting in machinery in the first place it is as easy to put a solid clutch on the shaft as a split one, and, therefore, the manufacturer by using a solid clutch and split sleeve would save the difference in price between the solid and split clutch, and also the trouble and time a solid sleeve may give him in getting it off the shaft.

By removing the nuts on the draw bolts I the driving plates and wood discs F, D, E and D can be moved out along the sleeve and cleaned off without removing any part of the clutch from the shaft. This is an important point with clutches using wood for friction surfaces, as the wood in time gets greasy which, if not cleaned, reduces the power of the clutch.

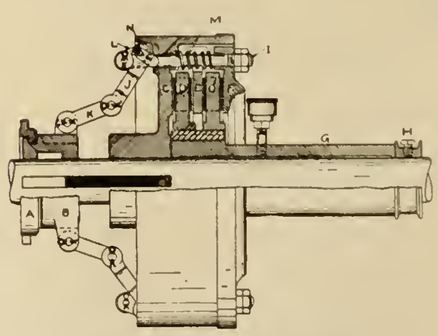


Fig. 2.—Friction Clutch.

This clutch is manufactured by the Ideal Clutch Mfg. Co., 16 Pearl St., Toronto. The A. R. Williams Co., Toronto, and Williams & Wilson, Montreal, are selling agents.

THE WEBSTER HUMIDIFIER.

Something new is being placed on the Canadian market in the Webster Air Washer and Humidifier that is used in connection with the Webster system of steam circulation for heating purposes, for which Darling Bros., Montreal, are the agents. It consists principally of a spray chamber and an eliminator made of galvanized iron or copper. The air to be washed, humidified or cooled, passes first into the air chamber where it is thoroughly washed and cleansed by passing, as may be desired, through from two to four sheets of water, having a combination "rain-and-spray" effect.

These effects are produced by special patented copper spray heads, and it is found that these remove dust and dirt from the air and have a great cooling effect. After leaving the spray chamber

Webster Humidifier.

the air passes through the eliminator, where all the entrained water or unevaporated moisture is removed, thence through the ventilating systems into the building.

The special feature of the Webster eliminator is the use of horizontal baffle plates and any entrained water is carried off at once horizontally to a gutter and returned to the water tank, thus preventing re-contact with the lower strata of air passing through the eliminator. A water tank which may be made of concrete, galvanized sheet iron or copper, contains the spray water which is circulated by hydrostatic pressure by means of a centrifugal pump. The illustration is a view showing the spray chamber and eliminator.

Mr. G. K. McMullen, for over ten years sales manager of Fox Machine Co., Grand Rapids, Mich., will engage in business for himself.

CANADIAN MACHINERY
AND MANUFACTURING NEWS

A monthly newspaper devoted to machinery and manufacturing interests mechanical and electrical trades, the foundry, technical progress, construction and improvement, and to all users of power developed from steam, gas, electricity, compressed air and water in Canada.

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SUBSCRIPTION RATE.

Canada, United States, $1.00, Great Britain, Australia and other colonies 4s. 6d., per year; other countries, $1.50. Advertising rates on request.

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Vol. IV. DECEMBER, 1908 No. 12.

THE NEW BRITISH PATENT LAW.

Since our last issue there have been several developments in connection with the new Lloyd George Patent Law, which came into effect August 28, 1908. It is authoritatively stated that a syndicate comprising German, American, Russian and French capitalists is being formed to acquire English factories for the making of British patented articles at cost price, the syndicate charging a small commission on the sales. This is the alternative to the expensive building or hiring of factories in England equipped with plant and large staffs of workmen. It is intended to begin next year with 20 factories acquired in this way.

Another point of interest, especially to small concerns who cannot afford the outlay of establishing a factory in England, is that various large companies, like the Manchester Ship Canal, are offering to build and lease warehouses, where, by co-operation, smaller patentees may, at less expense, manufacture and work their patents under the new British law, thereby safeguarding their own interests.

Britain grants about 15,000 patents per year. Of these about 2,100 are granted to German subjects, Germany granting only about 600 a year to British subjects, and about 2,600 patents are granted annually in Britain to the United States. There are about 2,000 Canadian patents registered in Great Britain. The holders of these are taking steps to interest the Canadian Government in securing the exemption of Canadian patents from the workings of the new law.

A number of English firms are understood to be forming a company to manufacture patents which have automatically lapsed. In order to prevent this appropriation of patents the companies mentioned in previous paragraphs have been formed to manufacture a patent for a small commission. Already some of the present factories are being enlarged to fulfil arrangements with foreign patentees who do not propose to establish works in Great Britain. Unless Canadian patentees make some arrangement to guard their patent by arranging for its manufacture in Great Britain it will be forfeited. Hence the agitation now on foot to have Canada exempted from the law.

Canada has given Great Britain a preference without any provision whatever. The appreciation of the British Government could be shown by exempting Canada from the working of the act. In Great Britain the Patent Law has given a great impetus among towns and districts to attract new industries, and it would have the same effect here if Canada did not come within the scope of the law. The preferential tariff between France and Canada will have its good effect. It is understood that the Deering Co., who transact about $2,000,000 business annually with France will manufacture machinery for the French market here to obtain the benefit of the preferential tariff. United States manufacturers are making inquiries in regard to the position Canada occupies in regard to the British Patent Law, and it is to be hoped that the Canadian Government can make arrangements with Great Britain for the protection of its patents.

A CO-PARTNERSHIP SCHEME.

Sir Christopher Furness, the head of Furness, Withy & Co., West Hartlepool, England, when asked to make better terms for his employes, frankly assured them that the state of the industry made this impracticable, and offered either to sell out to the men and let them manage the business or to take them into a co-operative partnership with the proprietors.

A deputation of labor men who waited on Sir Christopher with regard to it reported favorably, and at a meeting of representatives of the trade unions a resolution was carried approving of the scheme of co-partnership and recommending its acceptance by the local branches of the various unions concerned, with an experimental period of 12 months.

The report of the deputation was considered very satisfactory by the unions. The workmen will have to take up shares to the value of £10 paid for a reduction of 5 per cent. in wages.

Sir Christopher is genuinely pleased at the prospect, and is confident that after a year's trial the men will be unanimous in favor of continuing the partnership. In his published statement on the subject he dwells upon the advantage to the management of having loyal workmen, and predicts that the Hartlepool works will be in a better position to compete for shipbuilding contracts when the manager is able to give definite dates of delivery. Such a proposal as that made by Sir Christopher Furness to his employes is not new either in theory or in practice. The importance of the Hartlepool experiment, if it is tried for a twelvemonth, is that it will be conducted on a large scale and be applied to a considerable variety of callings co-related into one comprehensive organization. If it succeeds under conditions so severe it should succeed under conditions less exacting, and, therefore, Sir Christopher was quite justified in saying the question is not a local one.

FOUNDRY PRACTICE AND EQUIPMENT

Practical Articles for Canadian Foundrymen and Pattern Makers, and News of Foundrymen's and Allied Associations. Contributions Invited.

METAL MARKETS.

Since our last report on the situation the metal markets have undergone a shake up. A strong burst in buying and a stronger burst in speculation marked the coming and going of the Presidential election. All the metals advanced in price, but notably tin and copper. A pronounced bulling movement took place in London, and New York followed suit. Legitimate buying then fell away again, and as manipulation could not hold quotations at their high, comparatively speaking, level, a reaction followed. This in turn was followed by the advancing movement now on, and which may or may not continue. It all depends upon the consumptive demand in the States.

No doubt a good many consumers bought more than their legitimate requirements in order to make themselves secure for a while in case prices went far ahead. For a time, therefore, the demand will be quiet. Undoubtedly the markets have shown signs of getting beyond business conditions, but the reaction will give them the opportunity to establish a stability which otherwise would have been lacking. A slow, steady progress is what is now wanted, with little "bulling" or "bearing."

Prices, as we have said, advanced considerably, and naturally in the end Canadian quotations followed. Business has been very good in this country during the month, especially in tin. There is always a heavier movement about this time as merchants, to a greater or less extent, cover their requirements before winter rates commence. But, apart from this, there is apparently a disposition generally to buy further ahead than has been the case during the whole year. This is satisfactory, as it shows that users are not only displaying more confidence in the trend of the markets, but that they expect more business themselves. Inquiries have been very good in all metals lately, and if the markets continue firm much business should result. Sheets have likewise been selling well.

Tin in the home markets advanced under the influence of the speculation and stimulated buying abroad, and was marked up during the month 1c, but when the break in the English market occurred quotations were reduced ½c and jobbing prices around 33½c obtained. The metal has been a strong seller in Canada and inquiries point to a very good business in the future, especially if the primary markets get into firm and steady shape.

Copper, likewise, showed the effect of the strong movements in the primary markets and local figures advanced from 11c to 15¼c and 15½c, other lines such as bars, sheets, etc., being advanced 1c. A steady demand has been in evidence for copper, and inquiries as to future deliveries well to the fore. Already a good deal of spring business has been placed. The strong buying movement which was apparent in New York around election day fell off afterwards and but for the excitement attending the speculation in London, conditions would have again become dull. Although prices declined after the initial excitement producers held up the market well, and there has been no evidence of any attempt to force sales. Exports of copper have continued large all the month, and the position of copper is a strong one despite the reappearance of dullness in the market.

Pig iron conditions have changed very little. Good supplies of imported pig have been received and distributed to consumers. The last of the metal boats has arrived at Montreal and store prices will soon be in operation. Canadian furnaces have been busy and it is expected they will continue to be so. They are in a much better position to keep up a steady supply during the winter months than in the case of iron from abroad, and at prices which can be arranged to suit circumstances. Conditions seem to have improved across the Atlantic, although Cleveland warrants have shown some fluctuation. Finished steel prices have been well maintained. A strong buying movement has been experienced in the States. Higher prices have been asked all the way round and furnaces seem pretty well booked up. Business in finished steel products has also been greatly stimulated but the sensational accounts going round as to the business done in pig iron and steel must not be believed. Good business has been done, but nothing extraordinary as yet.

Lead has likewise advanced, quotations for imported pig being now between $3.80 and $3.85. Bars and sheets, however, have not been affected. Business on the whole has been satisfactory, orders having strengthened during the month. English quotations have been steadily advancing for some time and therefore it looks as if the stimulation across the Atlantic was due more to the improvement in the demand than to any sympathy with the higher speculative figures in tin and copper.

Spelter alone has remained steady and unchanged. Orders have been of fair size, with signs of developing strength. Both the London and St. Louis markets have shown consistent strength and undoubtedly in the former market buying has been greatly improved. Quotations in the St. Louis market are not so free from suspicion, as present figures are not believed to be commensurate with buying conditions.

MALLEABLE CAST IRON.*

By W. H. Hatfield.

Malleable cast iron consists of castings made by melting suitable pig iron and casting it into the required forms, which castings are, of course, annealed in order to produce the requisite malleability. The finished article, if successfully manufactured, possesses all the advantages of cast iron in that the low melting point of the pig iron allows the most intricate and difficult casting to be made, and these castings have the same beautiful skin and finish for which cast iron is so well known. As a further fact, it may be said that this material is practically free from blow holes, the composition of it ensuring the perfect occlusion of the gases which in a steel casting very often cause so much trouble. As regards the physical properties, it is malleable and ductile, and is easy to work in the machine shop.

All malleable cast iron when cast is identical in analysis with some variety of pig iron, it having present in its composition from 3 per cent. to 1 per cent of combined carbon, which gives to it that intense hardness which is found in the unannealed casting. The malleableizing of the material is done either by the oxidation and elimination of the carbon or by precipitating it into such a condition that it does not militate against the production of the qualities desired.

Certain specific conditions are, of course, necessary for the production of

* From a paper read before the Institution of Engineers and Shipbuilders in Scotland, March 17, 1908.

this material when the carbon is merely changed in form, and as the irons from which the malleable castings in this country and Europe are made are generally extremely high in sulphur, not being able to change the form, manufacturers in the past have had to eliminate the carbon. Consequently the method employed is that of Reaumur, viz., packing the castings with iron ore, which oxidizes and eliminates the carbon to such an extent that the casting has attained that degree of malleability which is desired, the fracture of such casting being very similar to that of steel.

The malleable castings produced in America are of the black heart variety, and generally speaking the American process consists of precipitating the carbon and not eliminating it. These are castings which, in the finished state, have the same composition as pig iron, and which bend double and fulfil the most stringent malleable cast-iron specifications. Owing to the natural resources of America producing a pure iron with very little sulphur, the secrets of the manufacture of black heart castings were quickly learned, and it is interesting to trace the rapid growth of this industry which to-day produces from 700,000 to 1,000,000 tons of malleable castings per year.

All malleable, as previously stated, consists of cast iron of suitable composition annealed in various ways with the usual result of a malleable product. In the Reaumur process as at present conducted, the castings are of such a composition that to render them malleable it is required to eliminate to a great extent the carbon originally present. Most of the malleable castings in Europe are of this type. The castings are packed in cast-iron boxes in hematite ore, and taken to a heat at which the ore commences reaction with the carbon in the castings.

This action is the converse of the production of steel by cementation, in which process the carbon enters from the outside and gradually permeates the whole bar. In the elimination of the carbon exactly the contrary takes place, and the carbon is gradually eliminated from the outside first, so it follows that the interior of one of these castings has generally considerably more carbon than the outside. If successfully manufactured, however, the carbon in the centre is in such a condition as not to militate against its working capabilities.

As to the actual chemical reaction which takes place between the iron ore and the carbon in the iron, it is not as yet sufficiently understood. However, it is known that gases easily diffuse through metals of the iron group in considerable quantities, and it is most likely that the action is somewhat dependent on the equation $CO_2 + C = 2CO$. In other words, the oxygen of the ore oxidizes the first carbon to CO_2, and this carbon dioxide possibly combines with more carbon, forming CO, which in itself receives further oxygen from the iron ore, and so what might be called catalytic action takes place in which the CO is the carrier of the oxygen from the ore to the carbon contained in the interior of the castings. Such explanation seems as likely as any other at present put forward.

The variety of malleable castings known as American black heart has for its essential distinction the fact that the castings when cast are of such a composition that the carbon, which previously exists as combined carbon, is by annealing completely changed to that condition of carbon known as annealing carbon, to which Ledebur, the German metallurgist, gave the name of temper carbon.

The author, in May, 1907, went thoroughly into this question of the change of the carbon, in a paper read before the Iron and Steel Institute, under the heading "Decomposition of Carbides."

	Max. Stress, Tons per sq. in.	Elongation, Per Cent.	Reduction of Area Per Cent.	Bending Angle
Cast Iron	12	......	...	....
Old Process Malleable (Reaumur)	21	3	1	45 deg.
American Black Heart	19	5	6	90 deg.
Spec. Malble. (Meadow Hall Iron Works)	23	11	17	180 deg.
British Admiralty Specification	18	1.5*	...	90 deg.**

*In 3 ins. **Over a 1-in. radius.

In the hard initial castings all the carbon is in the combined state, the carbon of "supersaturation" being present as carbide Fe_3C, whilst the carbon of "saturation" is present as a compound roughly equivalent to Fe_24C. The castings are heated up during the annealing process to the temperature required (this, of course, differs with different makers), maintained for a varying period at this temperature, and are then cooled. The result is a casting in which the carbides are completely broken down into pure carbon and iron.

Reference will now be briefly made to wrought iron, which is prepared by eliminating in the plastic condition, by means of oxides, the carbon and other impurities from pig iron. The result is pure iron, with traces of sulphur, phosphorus, manganese, and a little carbon, with a varying proportion of slag, the slag being mechanically contained in the iron. Wrought iron of the best make is as pure as iron can commercially be made, and everyone is familiar with its great ductility and malleability. Apart from iron, the only content of this material worth considering is the involved slag, which, during the rolling out of the iron, is drawn into threads running the length of the bar, and gives to wrought iron that peculiar fibrous nature of the fracture. Of course, there is no such thing really as fiber in iron products, as they are all crystalline.

It is obvious that this slag is practically of no detriment to the high properties of wrought iron. Wrought-iron forgings, were it not for their high cost, are unquestionably excellent, and in working upon the subject of malleable cast iron, wrought-iron forging has been taken as a basis, and the endeavor has been made to produce in a malleable casting a structure as similar as possible.

The maximum stress in wrought iron is approximately 20 tons to 21 tons per square inch, and its elongation will vary from 20 per cent. to 30 per cent. Now, if this is compared with recently published tests of malleable cast iron, viz., about 20 tons tensile strength with 1 per cent. to 6 per cent. elongation, it will be noticed that there remains considerable scope for improvement in the last-mentioned product.

Working on these lines, bars have been produced giving a tensile strength of 23 tons along with 19 per cent. elongation, 20.6 per cent. reduction of area, along with 180 degrees bending angle. Such material which is, of course, a casting and not a forging—is, one might almost say, a new product. The old tests for malleable cast iron have been left far behind, and a material has been produced which has before it a much greater field than the original malleable cast irons.

These special castings are very similar in structure to wrought iron. Microscopically they consist of ferrite, which is pure iron, with free carbon in such a form as will be obvious by the results obtained to be little more detrimental than the slag which is found in wrought iron; in fact, samples of wrought iron have been met with which have not

given much better results than the tests submitted in this paper. It will be well to conclude by asking whether malleable cast iron with the properties and tests as stated is not entitled to a much higher position in the metallurgical world than it is given? And the author would venture to suggest that the "Nomenclature" Committee gave malleable cast iron undeservedly short shrift when they stated that it merely lacked "the extreme brittleness of cast iron."

The demand for malleable in this country as compared with that of the United States gives food for thought. The Americans are said to be producing over 90 per cent of the world's production, Europe only producing the remaining 10 per cent. Here in this country, a material giving tests considerably superior to those obtained in the States is produced, and yet this self-same material is excluded from any purposes for which in the States it would be allowed to be used. The foregoing table gives the comparative results which are now being obtained:

It will be noticed that in the special malleable, maximum stress is very high, while the ductility much surpasses that of any other malleable cast iron. One obvious feature will be the ease with which this material passes Admiralty requirements.

SPECIAL WHITING CUPOLAS.

The Whiting cupola, illustrated herewith, contains some points of interest. The shell is 108" in diameter, and wind box 130" diameter, and with a 10½" lining; has a capacity of 27 to 30 tons per hour. It is fitted with two rows of tuyeres, eight in each row.

Two Large Whiting Cupolas.

The bottom plate presents some new features in cupola construction. On account of extreme loads carried, bottom plate and framing is entirely of structural steel. It consists of a heavy steel plate securely riveted to shell and wind box sheets, and bolted in turn to the bottom frame, which consists of heavy steel beams securely riveted together. Hinge plates for bottom doors are steel castings riveted to structural steel frame.

For the usual curved columns, straight cast iron columns of circular hollow section are substituted. Each of these columns is provided with a large flange, making the use of a separate base plate unnecessary.

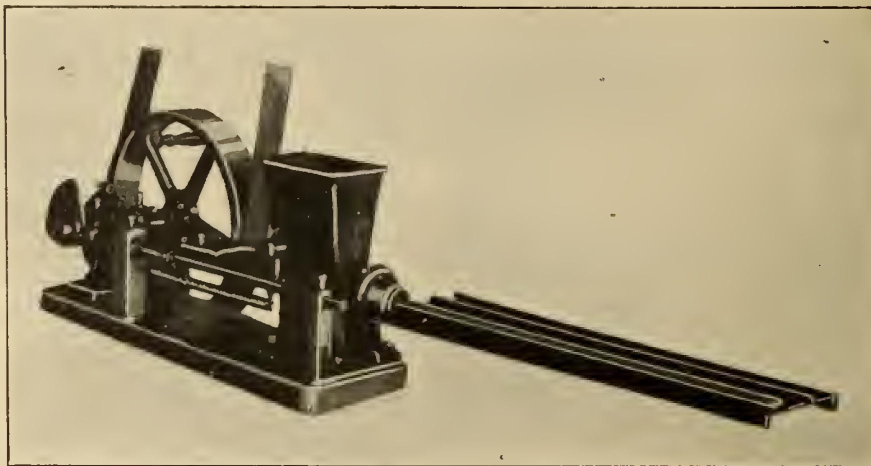
The safety tuyere on this cupola is provided with a spout projecting through shell of wind box. This spout is lined and is provided with the usual safety slide. It is located so that it can be always under the eye of the cupola tender.

Owing to the size and height required for bottom doors, the standard cupola is provided with an operator's platform built of structural material and checkered plate floor and substantial hand rails.

The illustration accompanying this article represents the two No. 12 cupolas of the Whiting Foundry Equipment Co., Harvey, Ill. These cupolas were built for the Standard Cast Iron Pipe & Foundry Co., Bristol.

NEW WADSWORTH CORE MACHINE.

An improved plunger feed core machine has been placed on the market, designed to make cores of irregular cross section for which screw feed machines are not adapted. This machine has a number of interesting features.



Wadsworth Core Machine—Back View.

The dies are made rectangular, oval, or any other form that may be desired, and the plunger corresponds to the die in shape. The end of the plunger is cut like a file, only coarser, so as to break up the surface of the sand where two portions join, and the plunger is also provided with one or more vent wires.

When a plunger moves forward through a body of sand that is not confined, it crowds the sand out of the way, and only a small portion of it will be forced into the die and crowded forward. To overcome this a very effective mechanism has been provided. The sides of the sand hopper are slotted a short distance above the plunger and a crosshead arranged which carries a shoe traveling over or above the plunger. This shoe covers the top of the plunger and also extends down across the sides.

The plunger is driven forward by an eccentric on the main driving shaft, so that it advances and recedes at the same speed and has a movement in common with all ordinary plunger machines. The shoe over the plunger has a sharp front edge so that it cuts through the sand as it advances. This shoe is driven forward by an eccentric on the main driving shaft, the eccentric being connected to the shoe by means of a crosshead and a connection on the side of the machine, not unlike that of the valve gear of an ordinary steam engine.

The cam is so laid out that just as the plunger starts forward the shoe is made to travel very much more rapidly than the plunger, so that it shoots forward and encloses a body of sand in front of the plunger. As this sand can-

not escape upward or to the sides, the advancing plunger crowds it into the dies and out on to the core plate. The cam then returns the shoe before the plunger recedes, so that the sand falls down in front of the plunger as it is withdrawn. The feeding of the sand in front of the plunger is assisted by a shaking plate which is operated by the receding shoe.

A view of the back of the machine is shown in the illustration, which shows the cam for driving the shoe above the plunger. This machine is capable of making cores from less than one-eighth of an inch in thickness up to any desired size within the capacity of the machine. Cores of any cross section can be made upon it.

This machine has been developed by George H. Wadsworth, of the Falls Rivet & Machine Co., Cayuga Falls, O.

KING CRUCIBLE MELTING FURNACE.

In modern brass foundry and alloy practice there has been for some time a demand for a satisfactory melting furnace which would reduce the melting cost to a minimum and also do the work quickly. On account of the numerous different mixtures of brass and alloys which are used to-day it is very desirable that the melting be done quickly, allowing the foundryman to supply any special mixture of metal required without difficulty and without delay to the customer.

In designing the King furnace the above mentioned points have been considered and good results obtained.

The Jacobs oil burner supplied with this furnace has many new features and is constructed on entirely new lines. A desirable feature is that only low pressure blast is required to operate it, the pressure needed being only from 6 to 8 oz., thereby making the operation practically noiseless.

In most cases the existing fan blast equipment in the foundry is satisfactory to use with the King crucible furnace. In cases where it is desired to locate the foundry on the top floor of buildings this type of furnace is very desirable as no pits are needed and all parts of the furnace are above the floor level. When required, a specially devised device can be supplied for the manipulation of the crucible when pouring. Height of King oil furnace over all is 2' 5". Floor space covered is 2' 6" x 2' 6".

This furnace is manufactured by Francis Hyde & Co., 31 Wellington St., Montreal. They also manufacture the King crucible furnace in the tilting type, as well as other types of furnaces for rivet heating, flue welding, annealing, forging, etc.

CENTRAL RAILWAY AND ENGINEERING CLUB.

The regular monthly meeting was held at the Rossin House, Toronto, on Nov. 17. W. Hall read a paper on the "Electrification of the Sarnia Tunnel."

CANADIAN RAILWAY CLUB, MONTREAL.

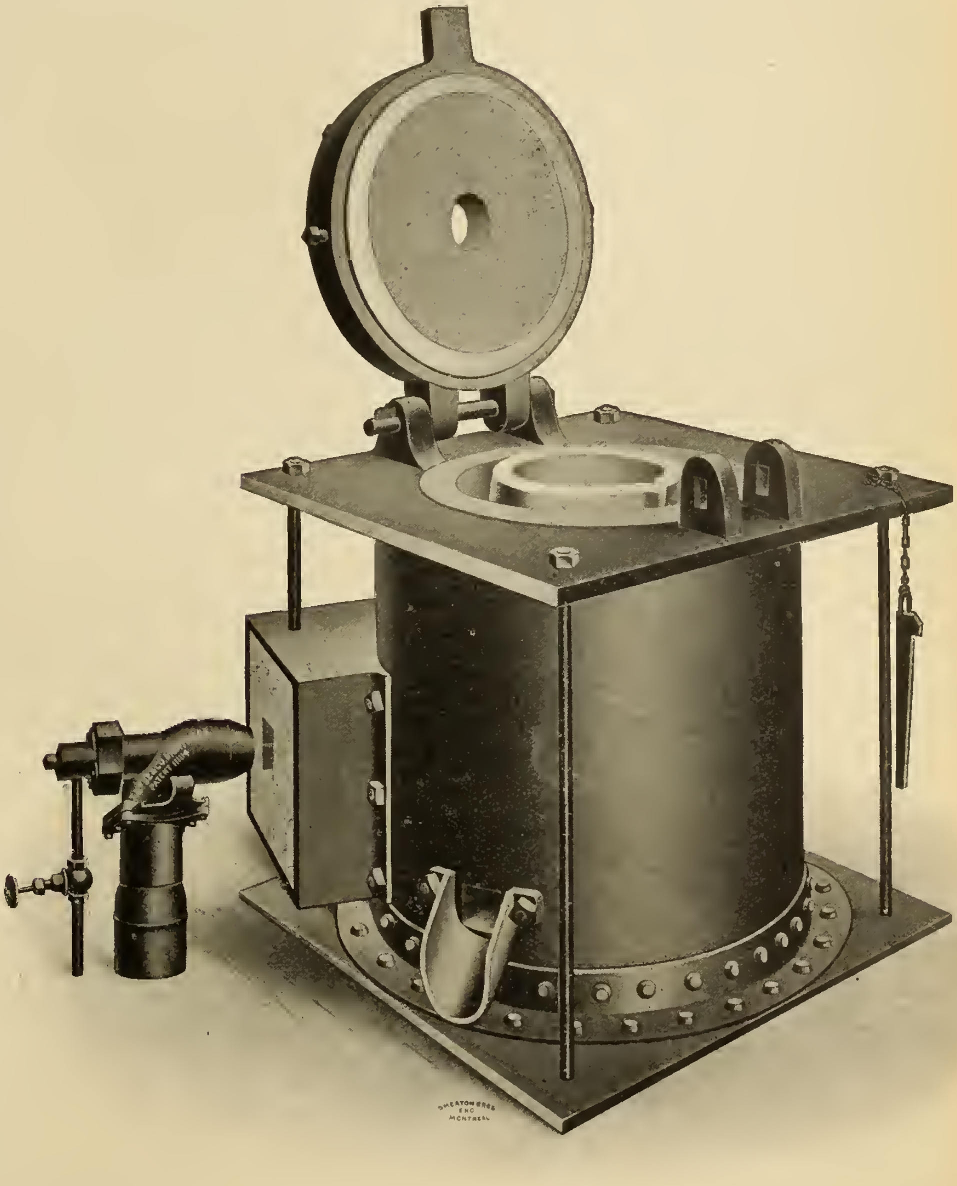
On Nov. 3, Walter V. Turner read a paper on "Brakes for Freight Cars, Both From an Economic and Operative Point of View." He reviewed the conditions affecting this phase of the brake problem.

These arrangements have been made for meetings at the Windsor Hotel, Montreal: December, a paper on Steel Rails, by F. P. Gutelius, and in January a lecture on British Columbia, by Prof. Bancroft.

Bruce Robb, son of W. D. Robb, Supt. Motive Power G.T.R., won the McGill scholarship of the club, entitling him to course in Railroad Transportation at McGill University, Montreal.

CANADIAN SOCIETY OF CIVIL ENGINEERS.

The following is the programme for the next month's meetings at 413 Dorchester St., Montreal: Dec. 3, Mechanical; Dec. 10, Business Meeting; Dec. 17, Mining Section.



The King Crucible Oil Furnace.

The Toronto branch of the Can. Soc., C.E. have invited the parent society to hold the next annual meeting, which will be held during January, 1909.

On Nov. 19 the following papers were presented: Notes on Canadian Forestry, by S. Gagne and Mean Sea Level at Quebec and New York, by W. Bell Dawson.

INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News.

Foundry and Machine Shop News.

A match factory may be established at Selkirk, Man.

Saskatoon, Sask., is figuring on the erection of a flax mill.

The Acadia Gas Engine Company, of Bridgewater, N.S., will erect a new factory.

The Pintsch Gas Co., New York, have completed arrangements to establish a plant in North Bay.

The Acadia Gas Engine Co., with a capital of $50,000, is a new concern which will locate in Bridgewater, N.S.

The C. Mathison Machine Works Co., of Beloit, Wis., may locate in Fort Frances, where they would erect a foundry and factory.

The manager of the Birkenhead, Eng., Car Mfg. Co., is negotiating with the City of Winnipeg, with a view to the establishment of a branch factory in that city.

The Lennox Furnace Company, of Marshalltown, Iowa., are considering the attractions of Winnipeg and Fort William, with a view to building a Canadian branch.

The Weber Gas Engine Co., of Kansas City, Mo., will establish a Canadian factory. The town where the industry will be located has not yet been decided upon.

The R. Watt Machine Works, Ridgetown, have moved part of their foundry to their property near the Pere Marquette, where their plant has been enlarged to accommodate increased business.

The London Machinery Co. are having improvements made to their buildings at Guelph.

Operations have commenced at the new foundry of the Reid Foundry and Machine Co., Ingersoll.

A big concrete machine shop is being erected by the Canadian Northern Railway at Prince Albert. It is 70 feet long by over 40 feet wide. The shop is well designed to handle the heavy class of repairing which will be carried on there.

A big sewer pipe firm from Webster City, Iowa, may locate in Medicine Hat. The company will expend $150,000 in plant and buildings, and will employ 75 men the year round. Warren Overpack is the representative of the company.

Electrical Undertakings.

The first Canadian electric locomotive is now being built in the Canadian General Electric works, Peterboro. It has been built for use in a tunnel at Shawinigan Falls.

Plans are being made to organize a local telephone company to build a system in the town of Dundurn, Sask., with rural lines to adjacent districts. E. J. Meilicke is interested.

The engineering staff of McGill University, Montreal, are considering plans and equipment for the instalation of a central plant for the generation and distribution of the power used in the various buildings.

At the approaching municipal elections in Windsor, Ont., the ratepayers will be asked to vote on a by-law to authorize the expenditure of about $25,000 or $30,000 in order to provide a practically new lighting plant for the city.

The Deloro Mining and Reduction Co., Ltd., are negotiating for electric power from Campbellford. It is stated that the contract calls for 500 horse power delivered at the mines. Marmora may also secure power from the same source.

The Wentworth county council has granted a franchise to F. Reinke and C. Shaver to erect a telephone line between Ancaster, Ont., and Waterdown, Ont., a distance of about 21 miles. The cost of the system is estimated at about $10,000.

A telephone company has been formed in Cranbrook, B.C., to be known as the Kootenay Telephone Company, Limited, which will be capitalized at $200,000. It has purchased the Cranbrook Telephone Company's system and will operate within the boundaries of British Columbia.

A project is under way to connect Morrisburg with Ottawa by an electric railway. The proposal is to build a line from Morrisburg to a point on the New York and Ottawa Railway, which extends from Ottawa to Cornwall, and to utilize about 20 miles of the New York and Ottawa line from Russell Village to Ottawa.

The first sod in connection with the building of the Toronto-Niagara transmission line was turned Nov. 18, and work will now be carried on until the line is completed. It is understood that it will take the steel and iron manufacturers some eight weeks to make and deliver the materials, but a good start will be made with the work this fall.

Mr. McKenzie, chief engineer of the Intercolonial Railway, has asked for tenders on the electrical equipment for the power house of the Prince Edward Island Railway at Charlottetown, which consists of a 75 k.w. direct-current generator, with potential of 230 volts, direct connected to and mounted on same base with engine. The specifications state that the generator must be under control, so that it will not show a variation as great as 2 per cent.

Contracts for the materials which will go to make up the Government transmission line between Niagara Falls and the municipalities receiving electricity from the Hydro-Electric Power Commission have been made. The footings for the towers which will carry the wires are now finished. They are supplied by the Canadian Bridge Company, of Walkerville, and the Ontario Iron and Steel Company, of Welland. The towers themselves will be obtained from the Canadian Bridge Company. Aluminum cables will be purchased from the Aluminum Company of North America, at Shawinigan Falls, Que. Thus, all these parts of the transmission line will be obtained from industries located in Canada.

The Dufferin Light and Power Co., in which Toronto, Orangeville and Shelburne men are interested, has bought out C. W. Watson's electric lighting plant and system in Orangeville, James Pickering's plant in Shelburne and the Huxtable water privilege at Horning's Mills. The Company, which has a capital stock of $260,000, proposes to develop 800 or 1,000 horse power at Horning's Mills and supply Orangeville, Shelburne, Grand Valley, Dundalk and possibly other places with electric energy for lighting and power purposes. The company has taken over and commenced to operate the Orangeville and Shelburne plants. Development work at Horning's Mills will be commenced early next spring and pushed through as speedily as possible.

Municipal Undertakings.

The waterworks mains in Ottawa will likely be extended to Rockcliffe.

Owen Sound will vote on a by-law to expend $100,000 on the extension of its waterworks system.

North Vancouver will have a new service reservoir in connection with its proposed waterworks extension.

The waterworks of North Vancouver will be extended, the recent sale of $35,000 of city waterworks bonds enabling the work to be proceeded with.

The by-law providing for the establishment of a civic electric lighting plant in Glencoe, Ont., was carried.

The sewers committee of Hamilton has awarded the contract of installing a sewer system on the mountain to Geo. F. Webb, at $26,140.

Haileybury will go ahead with a sewerage system, $20,000 bonds bearing 5 per cent. interest and repayable in 30 years having been disposed of to private citizens.

Gravenhurst is considering the question of waterworks and it is proposed to give a private company the right to lay the mains and instal a pumping station.

The International Heating and Lighting Co., of Cleveland, will instal a gas system in Portage la Priairie in 1909, and an extension of the time of the franchise is being asked.

Hamilton fire and water committee has accepted the tenders of the Canadian Westinghouse Company, Hamilton, and the John McDougall Company, of Montreal, for motors and pumps for the Beach pumping station, the combined cost being $20,148, or $2,028 higher than the tender of the General Electric Company, of Sweden, with the Montreal pumps.

Waterworks and Sewerage News.

It is the intention of the Saskatoon authorities to place a water main across the river below the footbridge about to be erected. Steel riveted spiral pipe will be used for the purpose of conveying the water from the power-house to the standpipe on Nutana Hill. The steel work of the bridge will be placed in position by Government men, while the city will do the rest.

At a recent meeting of the London city council an application was received from the London & Western Counties Pipe Line Company, which proposes to pipe natural gas from the Port Dover gas field, for a franchise enabling them to lay pipes and distribute natural gas in the city. There is no doubt that arrangements can be made with the City Gas Company to distribute the natural gas, but the pipe line company feel that it is better to run no risks. The application was referred to the finance committee.

The extensive sewer and waterworks programme mapped out by the City of Saskatoon at the first of the year is now more than half completed. The work is being done by the Saskatoon Construction and Engineering Co. The work contracted for will be finished in about four weeks. The city will then be supplied with about 29,000 feet of water mains, and 18,000 feet of sewers. Of the work undertaken this year 12,250 feet of water pipes of various sizes have been laid and 7,830 feet of sewer pipe. Of the work contracted for there yet remains 5,000 feet of water pipes and 4,000 feet of sewer pipes to be laid before the season closes down. Besides the above the Board of Works figure on extending the sewer and waterworks system further. The board has called tenders on an extension to Alexandra school, on the west side, and to the new city hospital at the north end. It is also proposed to extend the water system up Caswell Hill for fire protection. As far as the work has gone this year 25 hydrants have been installed along the route of the water main, thus giving the central part of the city at least good fire protection.

Excavating work on the sedimentation basin at the power house at Saskatoon is well under way. The work is in the hands of J. Priel. The basin, which will be divided in the centre when completed, is calculated to hold two million gallons of water. It will be 335 feet long and 105 feet wide. In this tank the water taken from the river close by will settle before it is pumped into the mains for use in the city. About nine feet of water will be kept in it. A concrete division wall in the centre will allow one-half to be cleaned out while the other is in use, thus one million gallons of water will always be on hand. The iron pipes of 8-inch diameter, have already been laid from the power house to the site. These serve as inlets and outlets. A 10-inch pipe serves for cleaning-out purposes. The new engine to cope with this extra strain on the machinery has not been installed, although it is expected here any day now. A generator will also be installed by the city to increase the electric light plant.

General Manufacturing News.

A No. 30 Newton cupola has been installed in the Rensselaer Polytechnic Institute, Troy, New York, during the past summer, making their foundry department a very complete one.

The Montreal Harbor Commissioners are considering the erection of a dry dock at that port. This will be large enough to accommodate the largest vessel likely to visit Montreal. Plans are already well advanced.

The Goulds Manufacturing Company, Seneca Falls, N.Y., have established a house in Coristine Building, Montreal, to be known as the Goulds Pump Company, with a view to taking care of their Canadian business.

The Nernst Lamp Company has received a contract from the Rosenbaum Company, proprietors of one of the largest department stores in Pittsburg, for an installation of 3-glower Westinghouse-Nernst lamps, replacing the 6-glower Nernst lamps which have been in use for the past four years.

The Independent Pneumatic Tool Co., who carry on a large trade in Canada, report an increase in October, 1908, of 25 per cent. over any other month during the present year in the sale of Thor pneumatic tools and appliances

The number of orders and inquiries received from railroads, foundries and machine shops augurs well for a great improvement in business during the next few months.

The International Jury of the Franco-British Exhibition have awarded two gold medals to Messrs. Hans Renold, Limited, for their display of driving chains in the classes, (a) Apparatus for the Transmission of Power, and (b) Machine Appliances and Accessories. This is a tribute to the excellence of workmanship of Renold chain, which gained for them also the highest award in their class at the Paris "Salon" last year. Jones & Glassco, Montreal, are the Canadian agents.

The Smart-Turner Machine Co., Hamilton, report the following recent orders for their pumps: Festrumate Co., Brantford; Robt. Simpson, Toronto; McColl Bros. & Co., Toronto; Grant's Spring Brewery Co., Hamilton; I.C.R., Newcastle, N.B.; Arscott Bros., Teeswater, Ont., and James & Reid, Perth, Ont. They are also supplying Quebec Gas Co., Quebec, with an oil pump, and the G.T.R. with a 20-ton Gantry crane.

Saw and Planing Mill News.

The Carnegie Milling Co. are erecting a new saw mill at Port Perry.

Larose & Larose will start a sash and door factory in Montreal.

F. A. McCallum's sawmill at Rodney, Ont., has been totally destroyed by fire.

Brayden & Johnston will erect a sawmill at Canoe Creek Siding, on Salmon Arm, B.C.

The Canadian Pacific Lumber Company's large sawmill at Port Moody, B.C., is now in full blast.

The Graham Island Lumber Company will build a large sawmill at Massett, on Graham Island, B.C.

The Sawmill of J. Moore, at Oliphant, Ont., was burned down a short time ago, with a loss of $7,000.

The new wood-working department of George White & Sons, London, has been completed and the plant is now in operation.

E. B. Dennison and Geo. Meyer, of Chicago, will erect a sawmill of 100,000 feet capacity on Smelter Lake, north of Grand Forks, B.C.

The Adams River Lumber Company, which is building a sawmill at Shuswap, B.C., will shortly begin work on another mill at Nelson.

M. J. Scanlon, of Minneapolis, is now completing arrangements for the erection of two large sawmills in British Columbia, at a cost of $750,000.

J. Guthrie, of the F. H. Rice Lumber Company, Victoria, will build a large sash and door factory at that place, with a capacity of 2,000 doors per day.

The Malcolm Lumber Company have taken over the business of the Telford Lumber Company at Fairview, B.C., and are putting up a 50,000 feet sawmill.

The P. Vincent Lumber Company, Limited, Montreal, Que., has been incorporated with a capital of $99,000. Incorporators, J. P. Vincent, H. Mathieu, E. M. and F. Tremblay and others all of Montreal.

The Matapedia Lumber Company, Limited, Causapscal, Que., has been incorporated with a capital of $150,000. Incorporators, J. B. Piche, O. N. Piche and J. N. Piche, all of Causapscal, and others.

The Canadian Cedar Timber Company, with a capital of $175,000, have been incorporated under the laws of Delaware, by C. Babcock and L. D. Wishard, of Montclair, N.J.; M. H. Hirschberg, of New York City, and D. J. Reinhardt, of Wilmington, Del.

The Langley Lumber Company, of Langley Prairie, B.C., have placed an order with the Schaake Machine Works, of New Westminster, for the entire equipment and instalation of a new 30,000 capacity circular sawmill, which they propose erecting at that place.

General Building Notes.

The Bank of Montreal will erect a $500,000 branch building at Winnipeg.

The Thunder Bay Elevator Co. will erect an elevator in Port Arthur to cost $500,000.

A $17,000 store and office building will be erected at Vancouver by P. Burns & Co.

An addition will be built to the factory of the Stratford Manufacturing Co., Stratford.

A big handling warehouse will be built for the G.T.P. at Fort William at a cost of $125,000.

W. Odell has the contract for building the new $60,000 sanitarium at Tranquille, B.C. The work will be rushed.

A theatre costing $40,000 will be built at Port Arthur by William G. Gillman. Work is to be commenced this month.

Robt. McDonald, Edmonton, has completed plans for the erection of a large brick and stone hotel to cost $20,000.

The factory of the National Manufacturing Co., makers of cream separators, scales, ranges, etc., which was destroyed in the recent Pembroke fire, will be rebuilt.

Plans for the new Hotel Fernie, at Fernie, B. C., are being prepared. The building, when completed, will be the finest in the Kootenays, costing in the neighborhood of $50,000.

A $150,000 modern fireproof hotel, seven storeys high, will be erected in Vancouver. It will be of pressed brick, stone and structural steel. Parr & Fee, Vancouver, are the architects.

Railroad News.

The C.P.R. has purchased thirty acres at Sherbrooke, and it is said a new station, divisional point buildings, and shops will be erected.

Tenders are being asked for the building of the branch line from Harmony to Elmira, of the Prince Edward Island Railway, a distance of ten miles.

The new C.N.R. branch west of Rosthern has been completed to Laird, the present terminus of the road. It was intended to build the line to Carlton, but the remaining few miles may be finished next year.

Great strides have been made during the season on the Moncton-Chipman section of the Transcontinental Railway, so much so that in a year's time Corbett, Floesch & Company, who have the contract for this portion of the work, expect to turn the section over to the Government.

The contract for the construction of new carshops, etc., for the Winnipeg terminals of the National Transcontinental Railway, has been awarded to Thomas Kelly & Sons, of Winnipeg. The tender calls for the expenditure of about $500,000, and the work will be started at once, thus giving employment to several hundreds of men during the coming winter.

The announcement from Winnipeg to the effect that the Canadian Pacific Railway is preparing to use electricity as the motive power for its lines in the Rocky Mountains opens up an interesting vista in railway development. As a matter of fact, the C.P.R. has already begun to utilize electricity on its lines, though only in a very small way. This is on the Crow's Nest branch in the Rockies, where a spur, used as a mineral line, is run entirely by electricity.

Companies Incorporated.

Stuart Bros., Mitchell, Ont.; capital, $40,000; to operate a flour mill. Provisional directors, S. R. Stuart, W. A. Stuart, Grace L. Stuart and Eliz. E. Stuart, all of Mitchell.

The British-American Metal Co., Toronto; capital, $50,000; to manufacture and deal in metals. Provisional directors, G. Booth and W. E. Booth, Toronto, and W. B. Manny, New York.

The Canadian Cleveland Drill Co., Toronto; capital, $7,500; to manufacture machinery and tools. Provisional directors, R. Credicott, W. B. Livett, W. Gilchrist, C. Y. Spearing and Alice M. Elliott, all of Toronto.

Canadian Felts, Montreal; capital, $1,000,000; to manufacture felt, knitted and leather goods, and boots and shoes. Provisional directors, E. F. Surveyer, A. Chase-Casgrain, J. W. Weldon, E. M. McDougall and S. J. LeHuray, all of Montreal.

The Empire Meter and Engine Company of Canada, Winnipeg, has been incorporated under the provisions of the Manitoba Joint Stock Companies Act, with a capital stock of $125,000. The incorporators are, George L. Rice, Chicago; George Irvine, Chicago; Fred J. Darch, London; George Goodfellow, Chicago, and W. R. K. Magill, Winnipeg.

Structural Steel.

A new steel bridge will be erected in Brandon, for which the Dominion Bridge Co., of Montreal, have the contract, the figure being $27,288.

The Collingwood Shipbuilding Co. have been awarded the contract for a second steel passenger and freight steamer for the Northern Navigation Company, to replace the old City of Toronto. The new steamer will be constructed of steel. It will be specially adapted for passenger and freight trade, and will have a guaranteed speed of sixteen miles per hour. The steamer will be 135 feet long, and 25 feet in width.

The Dominion Bridge Company have commenced the erection of the structural steel on the new Fort Garry depot, Winnipeg.

Tenders have been called for the construction of the Lulu Island bridge at New Westminster.

A new steel bridge has been erected at the entrance to Avondale cemetery, Goderich.

A steel bridge will be built over the Nottawasaga river, Simcoe county.

Steam Turbine Instalation.

The Dominion Iron & Steel Co., Ltd., Dominion Coal Co., Ltd., and Nova Scotia Steel & Coal Co., Ltd., are contemplating instaling steam turbine plants. The exhaust steam turbine is coming into use more and more every day, and is proving itself a necessity in large plants where economy is considered.

John Preston, mechanical engineer of the N. S. Steel & Coal Co., Ltd., at Sydney Mines, has been on a tour through the larger eastern cities of the United States, in order to see some of these plants in operation, and to determine if it would be advisable to instal a turbo-generator at Sydney Mines. He was very favorably impressed with the working of the plants which he visited in the States, and says that it is just what they want at Sydney Mines, and it is expected that the management will at once proceed to instal this addition to their plant.

The Dominion Iron & Steel Co. and Dominion Coal Co. are not quite as far advanced in the project, and may, possibly, not do anything until their case is decided in the Privy Council. However, there is little doubt, but that they will also add turbo-generators to their plants in the spring.

William Hamilton Co.

The president of the new company is Mr. Andrew McFarlane. For many years he was superintendent of the old company, and his practical knowledge of sawmill machinery will be of great advantage to the new company and all their customers. The board of directors consists of George G. Gladman, first vice-president, formerly of Parry Sound; W. H. Collier, second vice-president, a mechanical and electrical engineer; J. C. Smith, formerly office manager of the Wm. Hamilton Mfg. Company; David Spence, former manager of the foundry department of the Wm. Hamilton Mfg. Company; L. A. Potvin, secretary-treasurer; C. R. Cameron, former sales manager of the old company, who will occupy the same position with the new company.

The shops are being overhauled and put into better shape to handle all their work. The equipment is of a special nature for manufacturing sawmill machinery, and is thoroughly modern. William Hamilton Company are manufacturing a complete line of sawmill machinery for mills of all sizes, from the semi-portable of ten thousand feet per day capacity to the very largest stationary sawmill.

The company also conduct a mill supply department, from which they can furnish chain, belting, saws, etc., made by manufacturers in Canada and the United States.

G. T. R. Shops, Montreal.

A scheme has been evolved for the electrification of the G.T.R. shops at Pointe St. Charles, Montreal. It was decided some time ago to erect new buildings in which will be installed machinery of advanced modern type for the construction as well as repair of locomotives. The company has an agreement with the Montreal council by which it obtains tax exemption of the new buildings to be erected.

The power required for the operation of this plant will be produced from the company's own turbo-generators from coal it will transport from the mines. A start has already been made in the introduction of electrical machinery and this will be continued from now onward until the electrification is complete.

New Welland Industry.

The Dain Manufacturing Company, Ottumwa, Iowa, have secured one hundred and thirty acres of land on the Welland Canal, near Welland, and will erect a factory there for the manufacture of hay stackers, loaders, rakes, mowers, etc. A new company has been organized to handle the Canadian business. The capitalization of the Canadian branch is $200,000, and the provisional directors are, Joseph Dain, Paul Arbenz, F. M. Hunter, all of Ottumwa; B. J. McCormick and Col. L. C. Raymond, Welland.

Plans are already in the hands of tendering contractors and call for a main building 60x320

feet, with two L-shaped buildings 60x150 feet each, of brick on stone foundation. Two hundred men will be employed at the start.

Rail Joint Industry at Welland.

The Ontario Iron & Steel Co. are increasing their output, and are erecting a building 120x90 feet to turn out rail joints.

Rebuilding Smelting Works.

The smelting works owned by the Deseronto Iron Company, which were struck by lightning and burned down last September, are being built up again. The company expect to have the works in full operation by April next.

Rolling Mills at Cobourg.

It is expected that Cobourg will be the location of a steel rolling mills plant, and that work in the erection of the buildings will begin at an early date. The company state that they will employ 35 hands to begin with and more as they increase their plant. The main building is to be 350 feet by 80 feet. The company are asking the town for exemption from taxes and a fixed assessment for school taxes.

Hamilton Street Railway.

About 100 men and a number of teams have been put to work on the car barns and repair shops to be built on the block bounded by Sanford Avenue, King, Wentworth and Wilson Streets. It is expected that the work will cost about $75,000, but this will be only the preliminary expenditure, the total cost of the improvements being estimated at $150,000.

Profit-Sharing.

During the past week the B.C. Electric Railway Company has distributed their annual bonus. Every employe who has been with the company one year or more, from the highest official to the lowest, will benefit by the profit-sharing plan, adopted by the company. There has been distributed in all $45,000, here, in Vancouver and in Westminster, each employe receiving $66.78 as his share.

Foundry Equipment Shipment to England.

The Reid Foundry & Machine Co., Ingersoll, Shipped on Nov. 18, the first instalment of molding machines for a foundry in Leeds, England. This order, which was secured at the Foundrymen's convention, Toronto, consists of a complete equipment of 32 set of molding machines, patterns and flasks.

This company has added to its list of foundry equipment complete lines of flasks, in beveled, plain and ribbed styles. The joints are machined, making them fit closely. Flasks are interchangeable.

Opening of Reid Foundry.

What might be termed the formal opening of the well-equipped factory of the Reid Foundry and Machine Co., Ingersoll, took place last week. On the invitation of the company several of the members of the council, and representative business men were present to witness the taking of the first heat from the cupola.

The foundry is equipped with all modern appliances used in an establishment of this character and they handle both light and heavy castings with the same ease and despatch. Some of the castings handled on this occasion weighed nearly 1,000 pounds.

Power Equipment, Coristine Building, Montreal.

The power plant of the Coristine building, Montreal, has recently been enlarged by the addition of a battery of two 250 horse-power Babcock and Wilcox boilers, one 300 horse-power Wheelock engine, belted to a 200 k.w. Northern D.C. generator. This addition was necessitated by the fact that the power required for the new Coristine buildings, on St. Paul and St. Nicholas Streets, is to be supplied from the central station in the old building. The plant, when completed, will supply eighteen hundred incandescent lights, nine Otis elevators, besides the power required for the James Coristine Company in manufacturing. The plant is also equipped with one 500 horse-power Cochrane heater and Blake duplex pumps. The electrical apparatus was installed by the Fred Thompson Company, Montreal, while the Ross & Greig Company, Montreal, installed the pipe work.

C.N.R. to Build Shops at Quebec.

The Quebec city council has received a proposition from the Canadian Northern Railway offering to build repair shops in the suburbs. The Quebec and Lake St. John Railway, now a branch of the C.N.R., is bound by contract to erect shops inside of Quebec limits. The C.N.R. ask to be relieved of that obligation because there is no ground suitable for railway repair shops inside of Quebec. Limoilou is suggested as a site and as the said municipality is about to be annexed by Quebec. The proposed shops will cost $200,000.

Canada Iron Corporation.

The prospectus for the Canada Iron Corporation has been issued. It is a consolidation of the Drummond interests. The Messrs. Drummond and their associates control several blast furnace plants, pipe foundries, general foundries, car-wheel foundries in Nova Scotia, Quebec and Ontario, and almost inexhaustible iron ore deposits in Ontario, New Brunswick and Nova Scotia. The contemplated addition of steel works will complete the cycle. The capitalization of the corporation is $8,000,000. The estimated annual profits on the earnings of the mines, furnaces, and foundries is set down as approximately $600,000.

Exports of Sydney Rails.

The selling of 8,000 tons of Sydney rails for shipment to the Punjab appears not to be an exceptional transaction, but the beginning of an active export trade on the part of the Dominion Iron & Steel Company. An order for 16,000 tons for delivery early next year in New South Wales, Australia, is now reported to have been received by the company since the India business was booked. Following that again comes news of an order the company has received from Mexico. With the opening of the year 1909 the Steel Company will enter on a new era of rail making, contracts having been accepted for over 500,000 tons for railroads, quite enough to keep a full staff going for a couple of years.

New Rolling Stock.

The construction department of the C.P.R. is busy building new equipment at nearly the pace marked out when the country was in the heydey of prosperity. The Angus shops are turning out twenty freight cars a day, and will be doing so for the next six months at least.

Construction of new locomotives has been resumed at the Angus shops. Half a million dollars have been appropriated for this between now and the close of the fiscal year in June, and nearly $2,000,000 will be spent in passenger car equipment.

The Grand Trunk has just placed an order for 1,000 steel hopper coal cars with the Pressed Steel Car Company of New York.

The Canada Car Company is still busy with orders for Grand Trunk Pacific rolling stock, turning out about eight cars every working day, as it has been doing for the last four years. The original order was for 10,000 cars, and this has been executed and a new one undertaken. The cars are worth eight hundred dollars each, representing an expenditure of about $2,000,000.

BOOK REVIEW.

ELECTRICAL HANDBOOK, 1909—Issued by Mechanical World, 65 King St., Manchester, Eng., each year, 279 pages. Price, 15 cts. net.

Among the subjects included in this 1909 diary are motor generators, rotary converters, circuit breakers, balancers, boosters, electricity in mines, etc. The work has been thoroughly revised and many new illustrations added.

AMERICAN MACHINISTS' HANDBOOK AND DICTIONARY OF SHOP TERMS.—By Fred H. Colvin and Frank A. Stanley. 511 pages, 4x7 inches. Published by the Hill Publishing Co., New York. Price, $3.

This handbook contains a great deal of useful information which undoubtedly will be appreciated by the mechanical trades, presenting, as it does, in convenient form, such data as will be of value to practical men. It contains a great number of tables pertaining directly to shop and drafting-room work, as well as a number of such mathematical tables as will be found useful in a handbook of this kind.

Some of these tables have never before appeared in print. The book covers in a thorough detailed manner, screw cutting, milling machine practice, grinding, tapers, etc. It also includes a dictionary of shop terms.

MECHANICAL ENGINEERING AND MACHINE SHOP PRACTICE.—By Stanley H. Moore. 502 pages, published by the Hill Publishing Co., 505 Pearl St., New York.

The book is entirely practical and it covers every phase of machine shop practice. The chapters treat of equipment, materials, friction, cutting tools, measuring, screw data, bench and vise work, turning, boring, drilling, grinding, planing, milling, machine tools, shop kinks, power-generating machines, elementary electricity, power transmission, and motor drive. This list of contents indicates only the matter treated in the volume and is probably a better review than could otherwise be given of the book.

PATENTS AS A FACTOR IN MANUFACTURING.—By Edwin J. Prindle. 134 pages, published by the Engineering Magazine, 140 Nassau St., New York. Price, $2.

This volume tells in an interesting manner the nature of a patent, the value it affords, its advantages and court rules in connection with patents. The knowledge given in this volume should be of great value to inventors and manufacturers.

FOUNDRY WORK.—By Wm. C. Stimpson, head instructor in foundry work and forging, Department of Science and Technology, Pratt Institute. 160 pp., 150 illus. Cloth binding. A practical guide to modern methods of molding and casting in iron, brass, bronze, steel and other metals, from simple and complex patterns, including many valuable hints on shop management and equipment, useful tables, etc. Price, $1.

The book is published by the American School of Correspondence, Chicago. The feature of the book is its practical treatment of foundry work. The language is simple and clear and the matter is arranged to enable the reader to master the subject. The illustrations are apt and make the reading matter exceedingly clear.

CATALOGUES.

WRENCHES AND PLIERS—Booklet giving prices of these tools from Crescent Tool Co., Jamestown, N.Y.

WOODWORKING MACHINERY—Booklet from Berlin Machine Works, Hamilton, illustrating the lines of machinery carried by them.

THERMIT.—Application of thermit to foundry practice, from Goldschmidt Thermit Co., 90 West St., New York. It gives the methods used to avoid piping in steel ingots, and shows the methods of applying thermit.

CRANES—Booklet from Whiting Foundry Equipment Co., Harvey, Ill., containing a selection of illustrations of railroad crane installations.

WOOD-TURNING DEVICES.—Catalogue from S. A. Woods Machine Co., Boston, Mass., describing the Woods truing device for wood planer knives, and its application.

VERTICAL BORING AND TURNING MILLS—Leaflet describing 50-in., 60-in., 64-in. and 72-in. sizes, from Gisholt Machine Co., Madison, Wis.

DRILLS—Catalogue and price list No. 4 of high speed drills, made from flat bar stock from Hackett High Speed Drill Co., 90 West Street, New York City.

RIVETERS—64-page illustrated catalogue on heavy coated paper from Hanna Engineering Works, 820 Elston Ave., Chicago. The riveters are illustrated and described. A list of sizes is also given.

CYLINDER DRILL—Pamphlet describing cylinder turret drill presses from National Separator & Machine Co., 89 State St., Boston, Mass.

CORES—Booklet on Money-Making Hints for the Core Room, from S. Obermayer Co., Cincinnati.

GRAB BUCKETS—54-page illustrated catalogue on heavy bond paper from Brown Hoisting Co., Cleveland, Ohio, describing Grab buckets for handling coal, ore, limestone, etc.; double and single rope buckets, automatic dumping tubs, shovel buckets, etc.

TOOLS AND SUPPLIES—Stock list of machine tools and power equipment from H. W. Petrie, Toronto.

OIL FURNACES—Illustrated bulletin from Francis Hyde & Co., 31 Wellington St., Montreal, describing the King oil heater, King portable rivet furnace, King flue welding furnace and King crucible furnace.

SAND BLAST MACHINES—From Batcheller. Clark & Batcheller, Inc., 90 West St., New York, catalogue describing Danic blast machines, for which they are the sole selling agents. This

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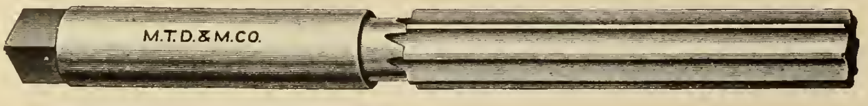

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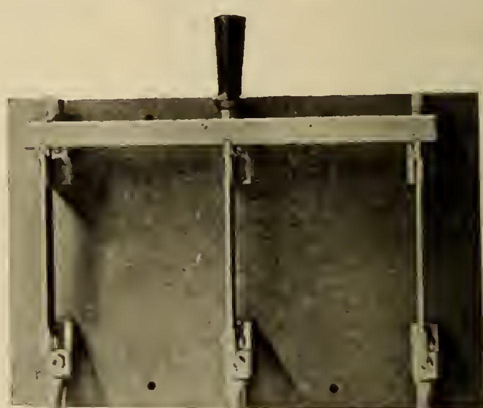

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John Bertram & Sons Co., Dundas, Ont.
Canada Machinery Agency, Montreal.
Cleveland Twist Drill Co., Cleveland
Gardner, Robt. & Son, Montreal
Hamilton Tool Co, Hamilton, Ont,
Jacobs Mfg. Co., Hartford, Conn
Ker & Goodwin, Brantford.
London Mach. Tool Co., Hamilton.
Milroy-Harrison Co., Toronto.
Mussens Limited, Montreal.
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.
Standard Tool Co., Cleveland.

Chucks (Planer or Milling.)
Gardner, Robt. & Son, Montreal
Holland's Mfg. Co, Erie, Pa.

Chucking Machines.
American Tool Works Co., Cincinnati.
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.
Warner & Swasey Co., Cleveland, Ohio

Circuit Breakers.
Allis-Chalmers-Bullock, Limited, Montreal
Canadian General Electric Co., Toronto.
Canadian Westinghouse Co., Hamilton.
Gas & Electric Power Co., Toronto.

Cloth and Wool Dryers.
B. Greening Wire Co., Hamilton.
Sheldons Limited, Galt

Coal Boring Machines.
Cumming, J. W., New Glasgow, N.S.

Coal Handling Machinery.
Jeffrey Mfg. Co., Columbus, Ohio
Waterous Engine Works Co., Brantford.

Coal Miners' Tools.
Cumming, J. W., New Glasgow, N.S.

Collars.
Dodge Mfg. Co., Toronto

Collectors, Pneumatic.
Sheldons Limited, Galt

Compressors, Air.

Allis-Chalmers-Bullock, Limited, Montreal
Canada Foundry Co., Limited, Toronto.
Canada Machinery Agency, Montreal.
Canadian Rand Co., Montreal.
Canadian Westinghouse Co., Hamilton.
Darling Bros., Ltd., Montreal
Hall Engineering Works, Montreal, Que.
H. W. Petrie, Toronto.
John McDougall, Caledonian Iron Works Co., Montreal
Monarch Eng. & Mfg. Co., Baltimore, Md.
Mussens Limited, Montreal.
Niles-Bement-Pond Co., New York.
The Smart-Turner Mach. Co., Hamilton.
Williams & Wilson, Montreal.

Concentrating Plant.

Allis-Chalmers-Bullock, Montreal.
Gardner, Robt. & Son, Montreal

Concrete Mixers.

Jeffrey M'f'g. Co., Columbus, Ohio.

Condensers.

Canada Foundry Co., Limited, Toronto.
Canada Machinery Agency, Montreal.
Goldie & McCulloch Co., Galt.
Hall Engineering Works, Montreal.
Smart-Turner Machine Co., Hamilton.
Waterous Engine Co., Brantford.

Consulting Engineers.

Connor, A. W., Toronto
Fensom, C. J., Toronto
Hall Engineering Works, Montreal.
Jules De Clercy, Montreal.
Roderick J. Parke, Toronto.
T. Pringle & Son, Montreal.
Stewart & McTaggart, Hamilton
Taylor, James, New Glasgow, N.S.

Contractors' Plant.

Allis-Chalmers-Bullock, Montreal.
John McDougall, Caledonian Iron Works Co., Montreal.
Niagara Falls Machine & Foundry Co., Niagara Falls, Ont.

Controllers and Starters Electric Motor.

Allis-Chalmers-Bullock, Montreal.
Canadian General Electric Co., Toronto.
Canadian Westinghouse Co., Hamilton.
T. & H. Electric Co., Hamilton.

Conveyor Machinery.

Dodge Mfg Co., Toronto
Goldie & McCulloch Co., Galt
Jeffrey Mfg. Co., Columbus, Ohio.
Laurie Engine & Machine Co., Montreal.
John McDougall Caledonian Iron Works Co., Montreal.
Mussens Limited, Montreal.
Smart-Turner Machine Co., Hamilton.
Waterous Engine Works Co., Brantford.
Williams & Wilson, Montreal.
Wilson, J. C., & Co., Glenora, Ont.

Coping Machines.

John Bertram & Sons Co., Dundas, Ont.
London Mach. Tool Co., Hamilton.
Niles-Bement-Pond Co., New York.

Corundum and Corundum Wheels.

Canadian Hart Wheels Ltd., Hamilton

Core Box Machines.

Fox Machine Co., Grand Rapids.

Core Cutting-off and Coning Machine.

Falls Rivet & Machine Co., Cuyahoga Falls, Ohio.
Hamilton Facing Mill Co., Hamilton.

Core Compounds.

Buffalo Foundry Supply Co., Buffalo.
Detroit Foundry Supply Co., Windsor.
Dominion Foundry Supply Co., Toronto
Hamilton Facing Mill Co., Hamilton.
Hyde, Francis & Co., Montreal
Smith, J. D., Foundry Supply Co., Cleveland, Ohio.
Stevens, F. B., Detroit, Mich.

Core-Making Machines.

Falls Rivet & Machine Co., Cuyahoga Falls, Ohio.
Hamilton Facing Mill Co., Hamilton.
Hyde, Francis & Co., Montreal
Smith, J. D., Foundry Supply Co., Cleveland, Ohio
Stevens, F. B., Detroit, Mich.

Core Ovens.

Detroit Foundry Supply Co., Windsor.
Dominion Foundry Supply Co., Montreal
Falls Rivet & Machine Co., Cuyahoga Falls, Ohio.
Hamilton Facing Mill Co., Hamilton and Montreal.
Hyde, Francis & Co., Montreal
Sheldons Limited, Galt
Stevens, F. B., Detroit, Mich.
Whiting Foundry Equipment Co., Harvey, Ill.

Core Prints——Standard.

Falls Rivet & Machine Co., Cuyahoga Falls, Ohio.
Hamilton Facing Mill Co., Hamilton.

Core Sand Cleaners.

Sly, W. W., Mfg. Co., Cleveland

Couplings.

Dodge Mfg. Co., Toronto
Gardner Robt. & Son, Montreal
Owen Sound Iron Works Co., Owen Sound
Wilson, J. C., & Co., Glenora Ont.

Couplings, Air.

Canadian Rand Co., Montreal.
Independent Pneumatic Tool Co., Chicago

Cranes, Electric and Hand Power.

Canada Foundry Co., Limited, Toronto
Canadian Rand Co., Montreal.
Dominion Foundry Supply Co., Montreal
Gardner, Robt. & Son, Montreal
Hamilton Facing Mill Co., Hamilton.
John McDougall, Caledonian Iron Works Co., Montreal.
Milroy-Harrison Co., Toronto.
Mussens Limited, Montreal.
Niles-Bement-Pond Co., New York.
Northern Engineering Works, Detroit
Owen Sound Iron Works Co., Owen Sound
Smart-Turner-Machine Co., Hamilton.
Smith, J. D., Foundry Supply Co., Cleveland, Ohio.
Whiting Foundry Equipment Co., Harvey, Ill.

Cranes, Hydraulic.

Whiting Foundry Equipment Co., Harvey, Ill

Crank Pin Turning Machine.

London Mach. Tool Co., Hamilton.
Niles-Bement-Pond Co., New York.

Crucibles.

Detroit Foundry Supply Co., Windsor
Dominion Foundry Supply Co., Montreal
Goldschmidt Thermit Co., Toronto
Hamilton Facing Mill Co., Hamilton.
Hyde, Francis & Co., Montreal
Siedel, R. B., Inc. Philadelphia
Smith, J. D., Foundry Supply Co., Cleveland, Ohio.
Stevens, F. B, Detroit, Mich.

Crushers, Rock or Ore.

Allis-Chalmers-Bullock, Montreal.
Jeffrey Mfg. Co., Columbus, Ohio.
Waterous Engine Works Co., Brantford

Cupolas.

Detroit Foundry Supply Co., Windsor
Dominion Foundry Supply Co., Montreal
De Clercy, J., Montreal
Hamilton Facing Mill Co., Hamilton.
Hyde, Francis & Co., Montreal
Northern Engineering Works, Detroit
Sheldons Limited, Galt.
Smith, J. D., Foundry Supply Co., Cleveland, Ohio.
Whiting Foundry Equipment Co. Harvey, Ill.

Cupola Blast Gauges.

Dominion Foundry Supply Co., Montreal
Hamilton Facing Mill Co., Hamilton.
Sheldons Limited, Galt

Cupola Blocks.

Detroit Foundry Supply Co., Detroit.
Dominion Foundry Supply Co., Toronto
Hamilton Facing Mill Co., Hamilton
Hyde, Francis & Co., Montreal
Northern Engineering Works Detroit
Ontario Lime Association, Toronto

Cupola Blowers.

Canada Machinery Agency, Montreal.
Detroit Foundry Supply Co., Windsor
Dominion Foundry Supply Co., Toronto
Hamilton Facing Mill Co., Hamilton.
Hyde, Francis & Co., Montreal
Northern Engineering Works, Detroit
Sheldons Limited, Galt.

Cupola Linings.

Hamilton Facing Mill Co., Hamilton.
Maurer, Henry, & Son, New York.
Stevens, F. B. Detroit, Mich.

Cutters, Flue.

Independent Pneumatic Tool Co., Chicago. Ill.

Cutters, Gear.

Milroy-Harrison Co., Toronto.

Cutter Grinder Attachment

Cincinnati Milling Machine Co., Cincinnati

Cutter Grinders.

Cincinnati Milling Machine Co., Cincinnati

Cutters, Milling.

Abbott, Wm., Montreal
Becker Milling Machine Co., Hyde Park, Mass.
Cleveland Twist Drill Co., Cleveland
Hamilton Tool Co., Hamilton, Ont.
Milroy-Harrison Co., Toronto.
Mussens Limited, Montreal.
Owen Machine Tool Co., Springfield, Mass.
Pratt & Whitney Co., Hartford, Conn.
Standard Tool Co., Cleveland.

Cutting-off Machines.

Armstrong Bros. Tool Co., Chicago
John Bertram & Sons Co., Dundas, Ont.
Burke Machinery Co., Cleveland, Ohio
Canada Machinery Agency, Montreal.
London Mach. Tool Co., Hamilton.
Mussens Limited, Montreal.
H. W. Petrie, Toronto.
Pratt & Whitney Co., Hartford, Conn.

Cutting-off Tools.

Armstrong Bros. Tool Co., Chicago.
London Mach. Tool Co., Hamilton.
H. W. Petrie, Toronto.
Pratt & Whitney, Hartford, Conn.
L. S. Starrett Co., Athol, Mass.

Damper Regulators.

Darling Bros., Ltd., Montreal

Dies.

Acme Stamping & Tool Co., Hamilton
Armstrong Bros., Toronto
Banfield, W. H. & Son, Toronto
Bliss, E. W., Co., Brooklyn, N.Y.
Ferracute Machine Co., Bridgeton, N.J.
Gardner, Robt. & Son, Montreal
Cleal, Joseph P., Toronto
Hall J. H., & Sons, Brantford
Hall, Jas. B., Toronto
Scott, Ernest, Montreal.
Standard Contracting Co., Toronto.
Stevens Co., Galt

Die-Making Machinery.

Stevens Co., Galt, Ont.

Die Stocks.

Canadian Tap & Die Co., Galt
Curtis & Curtis Co., Bridgeport, Conn.
Jardine, A. B., & Co., Hespeler, Ont.
Milroy-Harrison Co., Toronto.

Dies, Opening.

W. H. Banfield & Sons, Toronto
Jardine, A. B., & Co., Hespeler, Ont.
Pratt & Whitney Co., Hartford Conn.

Dies, Threading.

Canadian Tap & Die Co., Galt
Jardine, A. B., & Co., Hespeler, Ont.
Milroy-Harrison Co., Toronto.

Draft, Mechanical.

W. H. Banfield & Sons, Toronto.
Butterfield & Co., Rock Island, Que.
A. B. Jardine & Co., Hespeler
Pratt & Whitney Co., Hartford, Conn.
Sheldons Limited, Galt.

Drawn Steel, Cold.

Union Drawn Steel Co., Hamilton.

Drilling Machines, Horizontal.

John Bertram & Sons Co., Dundas, Ont.
Canada Machinery Agency, Montreal.
London Mach. Tool Co., Hamilton.
Mussens Limited, Montreal.
Niles-Bement-Pond Co., New York.

Drilling Machines, Locomotive.

American Tool Works Co., Cincinnati.
John Bertram & Sons Co., Dundas, Ont.
Bickford Drill and Tool Co., Cincinnati.
The Canadian Fairbanks Co., Montreal.
A. B. Jardine & Co., Hespeler, Ont.
London Mach. Tool Co., Hamilton, Ont.
Mussens Limited, Montreal.
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.
Williams & Wilson, Montreal

Drilling Machines, Multiple Spindle.

American Tool Works Co., Cincinnati.
John Bertram & Sons Co., Dundas, Ont.
Bickford Drill & Tool Co., Cincinnati.
Canada Machinery Agency, Montreal.
London Mach. Tool Co., Hamilton, Ont.
Mussens Limited, Montreal,
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.
Williams & Wilson, Montreal.

Drilling Machines, Radial.

American Tool Works Co., Cincinnati.
Bickford Tool & Drill Co., Cincinnati.
The Canadian Fairbanks Co., Montreal.
London Mach. Tool Co., Hamilton.
Mussens Limited, Montreal.
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.
Williams & Wilson, Montreal.

Drilling Machines, Turret.

John Bertram & Sons Co., Dundas, Ont.
London Mach. Tool Co., Hamilton.
Niles-Bement-Pond Co., New York.

Drilling Machines, Upright.

American Tool Works Co., Cincinnati.
Bawden Machine & Tool Co., Toronto.
John Bertram & Sons Co., Dundas, Ont
Fox Machine Co., Grand Rapids
Hamilton Tool Co., Hamilton, Ont.
A. B. Jardine & Co., Hespeler, Ont.
London Mach. Tool Co., Hamilton.
Mussens Limited, Montreal.

Drills, Bench.

Hamilton Tool Co., Hamilton, Ont.
London Mach. Tool Co., Hamilton.
Pratt & Whitney Co., Hartford, Conn.

Drills, Blacksmith.

Canada Machinery Agency, Montreal.
A. B. Jardine & Co., Hespeler, Ont.
London Mach. Tool Co., Hamilton.
Standard Tool Co., Cleveland.

Drills, Centre.

Cleveland Twist Drill Co., Cleveland
Milroy Harrison Co., Toronto.
Pratt & Whitney Co., Hartford, Conn.
Standard Tool Co., Cleveland, O.
L. S. Starrett Co., Athol, Mass.

Drills, Coal and Plaster.

Cumming, J. W., New Glasgow, N.S.

Drills, Electric.

Canadian Pilling Co., Montreal
Mussens Limited, Montreal.
Niles-Bement-Pond Co., New York.

Drills, High Speed.

Abbott, Wm., Montreal
Cleveland Twist Drill Co., Cleveland
Alexander Gibb Montreal.
Lincoln-Williams Twist Drill Co., Taunton, Mass.
Milroy-Harrison Co., Toronto.
Mussens Limited, Montreal.
Pratt & Whitney Co., Hartford, Conn.
Standard Tool Co., Cleveland, O.

Drills, Hand.

A. B. Jardine & Co., Hespeler, Ont.

Drills, Pneumatic.

Allen, John F., New York
Canada Machinery Agency, Montreal.
Canadian Rand Co., Montreal
Independent Pneumatic Tool Co., Chicago, New York
Mussens Limited, Montreal.
Niles-Bement-Pond Co., New York.

Drills, Ratchet.

Armstrong Bros. Tool Co., Chicago.
Cleveland Twist Drill Co., Cleveland
A. B. Jardine & Co., Hespeler,
Milroy-Harrison Co., Toronto.
Pratt & Whitney Co., Hartford, Conn.
Standard Tool Co., Cleveland.

Drills, Rock.

Allis-Chalmers-Bullock, Montreal.
Canadian Rand Drill Co., Montreal.
Jeffrey Mfg Co., Columbus, Ohio.

Drills, Sensitive.

American Tool Works Co., Cincinnati.
Canada Machinery Agency, Montreal.
Fox Machine Co., Grand Rapids.
McKenzie, D., Guelph, Ont.
Mussens Limited, Montreal.
Niles-Bement-Pond Co., New York

Drills, Twist.

Abbott, Wm., Montreal.
Cleveland Twist Drill Co., Cleveland
Alex. Gibb, Montreal.
Lincoln-Williams Twist Drill Co., Taunton, Mass.
Milroy-Harrison Co., Toronto.
Morse Twist Drill and Machine Co., New Bedford, Mass.
Mussens Limited, Montreal.
Pratt & Whitney Co., Hartford, Conn.
Standard Tool Co., Cleveland.
Whitman & Barnes Mfg. Co., St. Catharines, Ont.

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Hammant Steel Car and Eng. Works, Hamilton.

Dry Kiln Equipment.

Sheldons Limited, Galt

Dump Cars.

Canada Foundry Co., Limited, Toronto
Dominion Foundry Supply Co., Montreal
Hamilton Facing Mill Co., Hamilton.
Hammant Steel Car and Eng. Works, Hamilton.
Hyde, Francis & Co., Montreal
Jeffrey Mfg. Co., Columbus, Ohio
Koppel, Arthur Co., New York
John McDougall, Caledonian Iron Works Co., Montreal.
Niles-Bement-Pond Co., New York.
Owen Sound Iron Works Co., Owen Sound
Waterous Engine Co., Brantford.

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Sly, W. W., Mfg. Co., Cleveland

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T. & H. Electric Co., Hamilton.

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American Industrial Pub. Co., Bridgeport, Conn.

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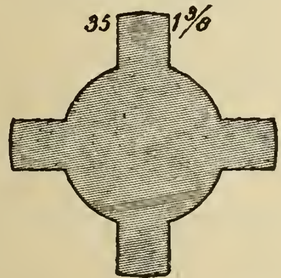

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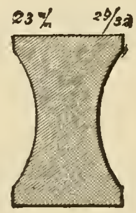

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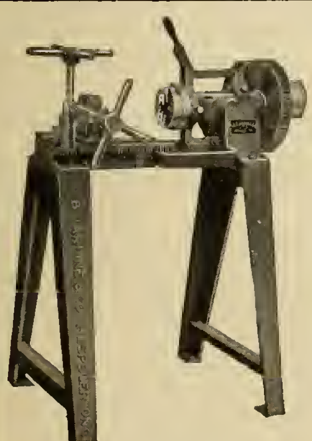

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Dominion Foundry Supply Co., Montreal
Gardner, Robt. & Son, Montreal
Hamilton Facing Mill Co., Hamilton.
Hyde, Francis & Co., Montreal
Milroy-Harrison Co., Toronto.
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Standard Tool Co., Cleveland.

Engineering Books.
American Industrial Pub. Co., Bridgeport, Conn.

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Canada Foundry Co., Limited, Toronto.
Darling Bros., Ltd., Montreal
Dynamic Machine Works, Montreal.
Goldie & McCulloch Co., Galt, Ont.
Hall Engineering Works, Montreal.
Laurie Engine & Machine Co., Montreal.
John McDougall, Caledonian Iron Works Co., Montreal.
Robb Engineering Co., Amherst, N S.
The Smart-Turner Mach. Co., Hamilton.
Taylor, James, New Glasgow, N.S.
Waterous Engine Works Co , Brantford

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Hall Engineering Works, Montreal.

Engines, Gas and Gasolene.
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Jones & Glassco, Montreal
Milroy-Harrison Co., Toronto.
Oliver, W H., & Co., Toronto
H. W. Petrie, Toronto.
The Smart-Turner Mach. Co., Hamilton

Engines, Oil.
Dinning & Eckinstein, Montreal,
Jones & Glassco, Montreal

Engines, Steam.
Allis-Chalmers-Bullock, Montreal
Belliss & Marcom, Birmingham, Eng.
Canada Machinery Agency, Montreal.
The Goldie & McCulloch Co., Galt, Ont.
Laurie Engine & Machine Co., Montreal.
John McDougall Caledonian Iron Works. Montreal.
Robb Engineering Co., Amherst, N.S.
Sheldons Limited, Galt.
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Sheldons Limited, Galt, Ont.
Standard Engineering Co , Toronto.

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Canadian General Electric Co., Toronto
Canadian Westinghouse Co., Hamilton.
Sheldons Limited, Galt, Ont.
The Smart-Turner Mach. Co., Hamilton.

Fans, Exhaust.
Detroit Foundry Supply Co., Windsor.
Dominion Foundry Supply Co., Toronto
Hamilton Facing Mill Co., Hamilton.
Sheldons Limited, Galt.

Feed Water Heaters.
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Laurie Engine & Machine Co., Montreal
John McDougall, Caledonian Iron Works Co., Montreal.
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Waterous Engine Works Co., Brantford.

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Smooth-On Mfg. Co., Jersey City, N.J.
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Hayes Run Fire Brick Co., Orvis, Pa.
Maurer, Henry, & Son, New York
Hamilton Facing Mill Co., Hamilton
Ontario Lime Association, Toronto
Penn, Wm., Silica Works, Philadelphia,
Stevens, F. B., Detroit, Mich.

Fireproofing Hollowtile.
Maurer, Henry, & Son, New York

Folding Rules.
Schuchardt & Schutte, New York.

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Hamilton Facing Mill Co., Hamilton.
Independent Pneumatic Tool Co., Chicago, Ill.
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H. W. Petrie, Toronto.
Sheldons Limited, Galt, Ont.

Forges, Oil Rivet.
Monarch Eng & Mfg. Co., Baltimore, Md

Forgings, Drop.
Bliss, E. W., Co., Brooklyn, N.Y.
John McDougall, Caledonian Iron Works Co., Montreal.
H. W. Petrie, Toronto.
Wilson, J. C., & Co, Glenora, Ont.

Forgings, Light & Heavy.
Hamilton Steel & Iron Co., Hamilton

Forging Machinery.
John Bertram & Sons Co , Dundas, Ont.
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London Mach. Tool Co., Hamilton, Ont
National Machinery Co., Tiffin, Ohio
Niles-Bement-Pond Co., New York.

Foundry Coke.
Baird & West, Detroit
Stevens, F. B., Detroit, Mich.

Foundry Equipment.
Detroit Foundry Supply Co., Windsor.
Dominion Foundry Supply Co., Toronto
Hamilton Facing Mill Co., Hamilton
Hyde, Francis & Co , Montreal
Northern Engineering Works, Detroit
Stevens, F. B., Detroit, Mich.
Whiting Foundry Equipment Co., Harvey, Ill.

Foundry Parting.
Doggett, Stanley, New York
Dominion Foundry Supply Co., Toronto
Foundry Specialty Co., Cincinnati.
Hyde, Francis & Co., Montreal
Partomol Co., New York
Swoboda, L. J., New York.

Foundry Facings.
Detroit Foundry Supply Co., Windsor.
Dominion Foundry Supply Co., Toronto
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Dodge, Mfg. Co., Toronto

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Monarch Eng. & Mfg. Co., Baltimore, Md

Furnaces.
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Dominion Foundry Supply Co , Montreal
Hamilton Facing Mill Co., Hamilton.
Hyde Francis & Co., Montreal
Monarch Eng. & Mfg Co , Baltimore
Northern Engineering Works, Detroit
Smith, J D, Foundry Supply Co., Cleveland Ohio.
Stevens, F B., Detroit, Mich.
Whiting Foundry Equipment Co., Harvey, Ill.

Furnaces, Brass.
Monarch Eng. & Mfg. Co., Baltimore, Md
Whiting Foundry Equipment Co , Harvey, Ill.

Gang Planer Tools.
Armstrong Bros. Tool Co., Chicago

Gas Blowers and Exhausters.
Sheldons Limited, Galt.

Gas Producer Plants.
Canada Foundry Co., Toronto
Gas & Electric Power Co , Toronto
Oliver, W, H., & Co., Toronto.
Jones & Glassco, Montreal
Williams & Wilson, Montreal

Gauges, Standard.
Cleveland Twist Drill Co., Cleveland
Pratt & Whitney Co., Hartford, Conn.

Gear-Cutting Machinery.
Armstrong Bros., Toronto
Becker Milling Mach. Co., Hyde Park, Mass.
Bickford Drill & Tool Co., Cincinnati.
Gould & Eberhardt, Newark, N.J.
London Mach. Tool Co., Hamilton.
Niles-Bement-Pond Co., New York.
H. W. Petrie, Toronto.
Pratt & Whitney Co., Hartford, Conn.
Schuchardt & Schutte, New York.
Williams & Wilson, Montreal.
Wilson, J. C., & Co , Glenora, Ont.

Gear Hobbing Machines.
Gould, Eberhardt & Newark, N.J.

Gears, Angle.
Boston GearWorks, Norfolk Downs, Mass.
Gardner, Robt., & Son, Montreal
Goldie & McCulloch Co., Galt, Ont.
Gould & Eberhardt, Newark, N.J.
Laurie Engine & Machine Co., Montreal.
John McDougall, Caledonian Iron Works Co., Montreal.
Waterous Engine Co., Brantford.
Wilson, J. C., & Co., Glenora, Ont.

Gears, Cut.
Boston Gear Works, Norfolk Downs, Mass
Dynamic Machine Works, Montreal
Gardner, Robt., & Son, Montreal
Goldie & McCulloch Co., Galt, Ont.
Gould & Eberhardt, Newark, N.J.
Horsburgh & Scott Co., Cleveland
New Process Raw-Hide Co., Syracuse, N.Y.
Wilson, J. C., & Co., Glenora, Ont.

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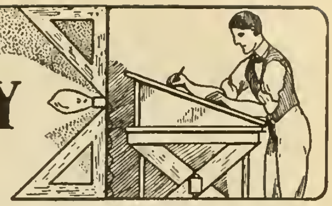

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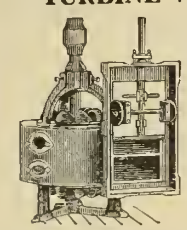

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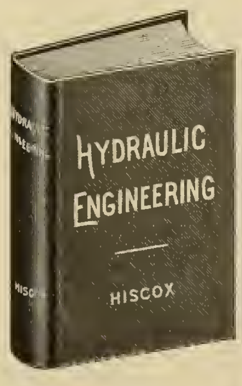

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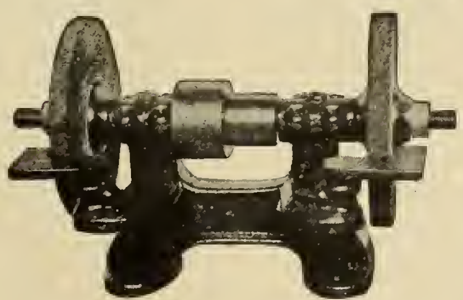

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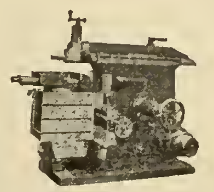

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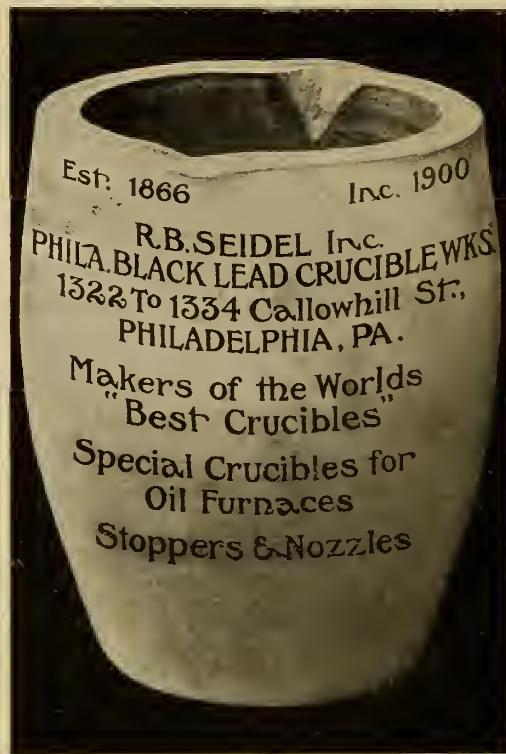

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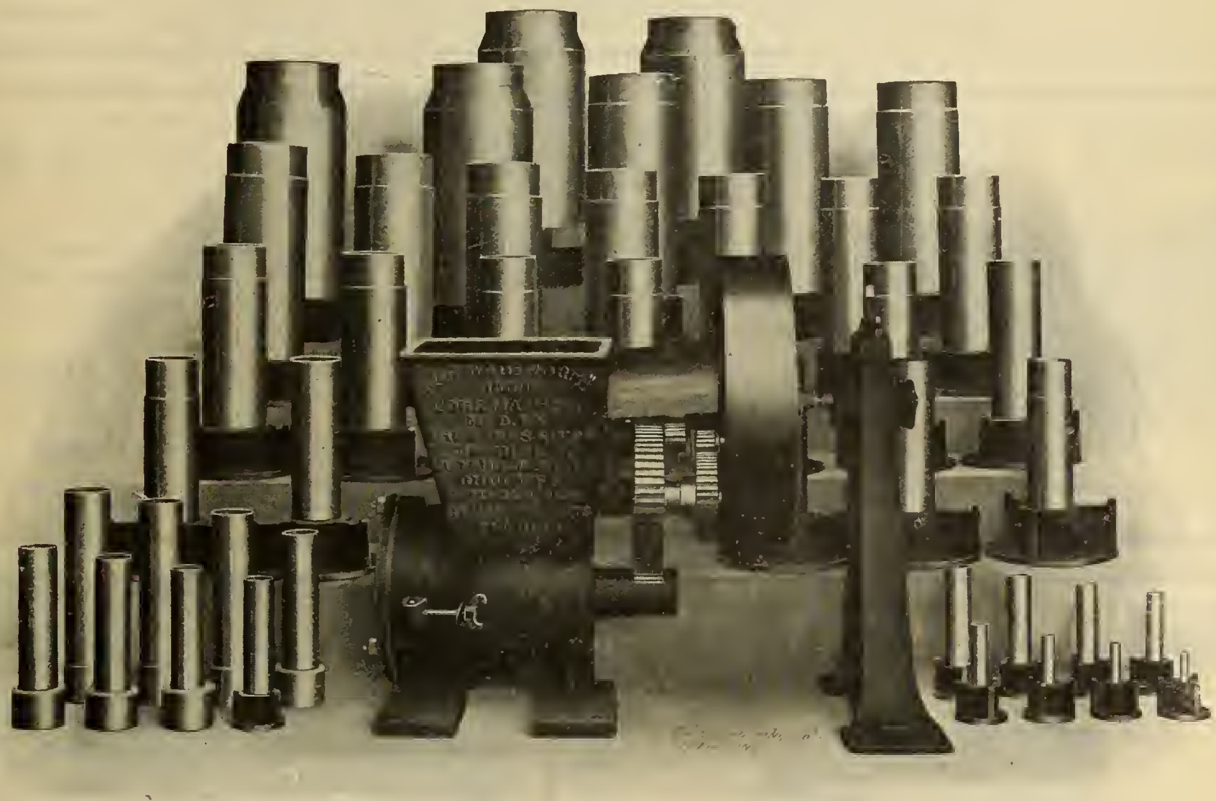

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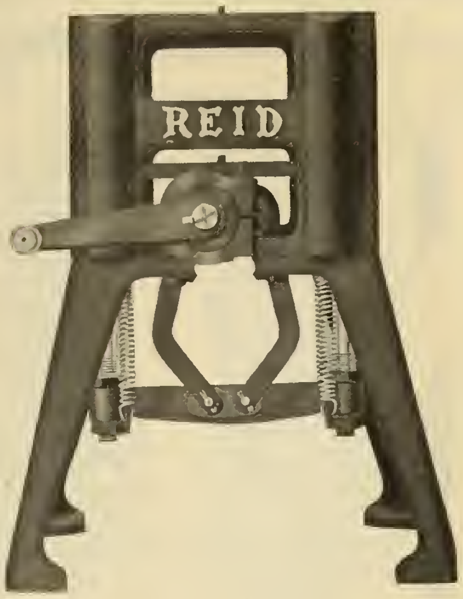

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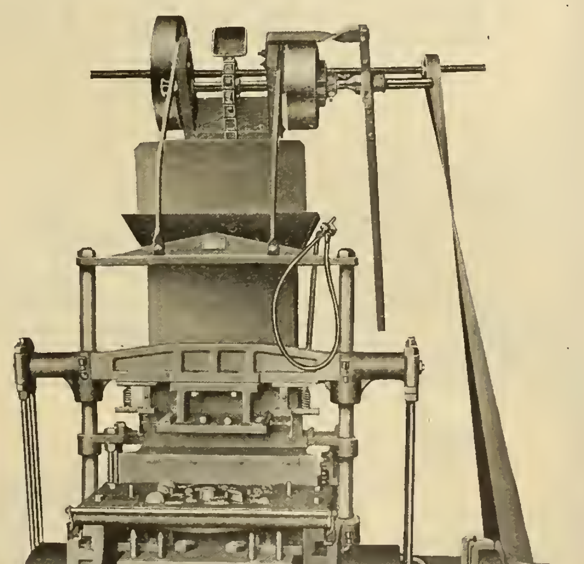

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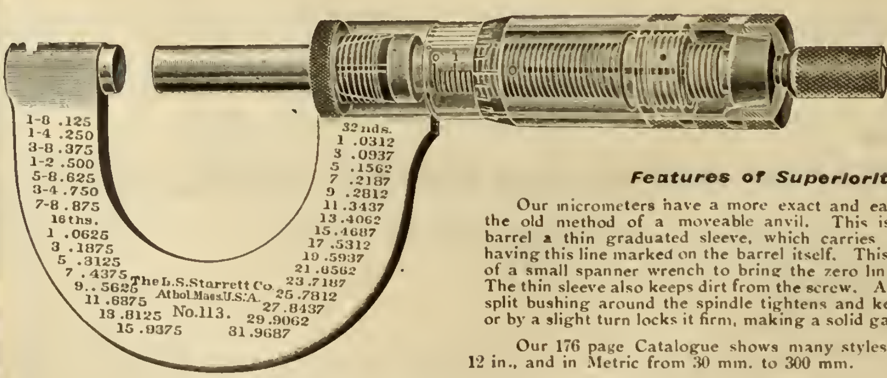

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